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[NOTICE.]

Thirteenth Annual Meeting, Pacific Coast Gas Association.

PACIFIC COAST GAS ASSOCIATION,
OFFICE OF THE SECRETARY,
SAN FRANCISCO, June 16, 1905.

The Thirteenth Annual Meeting of the Pacific Coast Gas Association will be held in the Assembly Hall of Mechanics' Institute, No. 31 Post street, San Francisco, Cal., July 18th, 19th and 20th. On the 17th the annual meeting of the Directors will be held at 8 P.M., Room 617 Rialto Building. All members are invited to attend the session of th, Board. On Tuesday and Wednesday regular sessions will be held from 10 A.M. to 12:30 P.M., and from 1:30 to 5:30 P.M. of each day.

At 6:45 P.M. of Wednesday the usual banquet will be held in Delmonico's restaurant.

On Thursday the annual excursion with luncheon to members, their families and friends, is arranged for. Headquarters for members will be on the sixth floor of the Rialto Building.

The following papers will be presented:

"Commercialism at Gas Association Conventions," by Mr. Lucius S. Bigelow.

"A Gas Man's Catechism," by Mr. John A. Britton.

"The Public Utility Corporation and the Municipality—Their Legal, Equitable and Economic Relations," by Mr. H. C. Brown.

"Wrinkles," Mr. Geo. S. Colquhoun, Editor.

A paper by Mr. H. L. Doherty; title to be announced.

"Question Box," Mr. E. C. Jones, Editor.

"Something About the Physics and Chemistry of Gas," by Mr. F. C. Jones.

"Gas Arcs," by Mr. W. M. Kapus.

"Association History," by Mr. Geo. P. Low.

"Utilization of Gas Engines in Connection with Long Distance Electric Transmission," by Mr. John Martin.

"Notes Regarding Gas Tars," by Mr. P. W. Prutzman.

"The Compression and Transmission of Illuminating Gas," by Mr. E. A. Rix.

"Experiences," Mr. R. P. Valentine, Editor.

"Suggestions for Increasing Gas Consumption," by Mr. J. W. Wrenn.

A paper by Mr. G. C. Holberton; title to be announced.

There will be an unusually interesting display of novelties in gas appliances during the session, special attention being given to exhibition of articles of merit and originality. Applications for membership will be received until Tuesday, July 18th, 1905.

In increase in membership, in number of interesting papers, the 13th, annual meeting promises to surpass all others, but to insure this, attendance of members is especially required. Make it a banner year in attendance; mix with your fellows; do team work.

Discussion of project for National Association will also be taken up.

In order that adequate arrangements be made for the meeting, it is essential to know in advance the number of members who will attend each of the functions. To that end kindly fill out and mail at once the inclosed postal, indicating by "Yes" or "No" answers to the various questions. Yours in the faith, JOHN A. BRITTON, Secretary.

[OFFICIAL NOTICE.]

Wrinkle Department, Western Gas Association.

OFFICE OF EDITOR, WRINKLE DEPARTMENT,
WESTERN GAS ASSOCIATION,
182 WISCONSIN STREET, MILWAUKEE, WIS.,
June 27th, 1905.

To the Members of the Western Gas Association: Your early attention and assistance are earnestly solicited in connection with the above Department for 1906. We are now ready to receive contributions and any device, plan, scheme, wrinkle, suggestion, formula or new method will be warmly welcomed. A full description, with sketch or photo, should accompany each contribution. Give us your help to make the 1906 Wrinkle Department a success. Thanking you in advance for your kind assistance, I remain, Yours truly, B. MCADAM, Editor.

[OFFICIAL NOTICE.]

Respecting the Official Work of the American Gas Light Association.

AMERICAN GAS LIGHT ASSOCIATION,
SECRETARY'S OFFICE,
530 Broadway, N. Y., Dec. 13, 1904.

To the Members American Gas Light Association: As there seems to be some misunderstanding respecting the standing of the official management of the Association, members will please note that the undersigned is the Secretary of the Association, and that Mr. A. E. Forstall is carrying forward the work of the Practical Class. All correspondence in connection with the Practical Class should therefore be

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addressed to Mr. A. E. Forstall, 58 William street, and all other matter pertaining to the Association to MR. GEORGE G. RAMSDELL, Secretary, at the above address.

[NOTICE.]

Wrinkle Department, Ohio Gas Light Association.

OHIO GAS LIGHT ASSOCIATION,
OFFICE OF THE WRINKLE DEPT.,
719 CITIZENS BUILDING,
CLEVELAND, O., June 13, 1905.

The Wrinkle Department of the Ohio Gas Light Association is now ready to receive contributions for the 1906 collection, and a sketch or description of all devices, formulæ and methods of accomplishing objects pertaining to the gas business, is respectfully solicited.

Please send a written explanation, accompanied by any sketch, photograph or drawing, to the above address, or a description alone will suffice.

Hoping to receive prompt compliance, Yours very truly,
W. E. STEINWEDELL, Editor.

BRIEFLY TOLD.

NOTES.—

MR. J. B. THOMSON, who successfully served the Rockville (Conn.) Gas and Electric Company as Manager since 1901, has resigned. His successor is Mr. Wm. M. Lewis, who was in charge of the plant and offices of the Somerville division of the Public Service Corporation of New Jersey.

MR. C. F. BUDENHAGEN has accepted a responsible place in the service of the Springfield (Ills.) Gas Company.

AT the annual meeting of the Milford (Mass.) Gas Light Company the reports for the year showed a most satisfactory increase in its trading. The officers elected were: Directors, B. E. Harris, N. B. Johnson, F. J. Dutcher, G. A. Draper, C. F. Claflin, L. H. Cook, L. N. Davis, J. E. Walker and J. B. Bancroft; Treasurer, H. E. Harris; Secretary, H. A. Brown—Mr. H. C. Tilden declining a re-election; Superintendent, E. J. Nutting.

WE are indebted to the Link-Belt Engineering Company, of Philadelphia, for a copy of its handsome booklet, devoted to an explanation of the system, plan and advantages of the Renold roller chain. It is well worth reading.

ADVICES by way of Boston, dated the 12th inst., say that the Board of Gas and Electric Light Commissioners has agreed to give a public hearing on the petition of the Boston Consolidated Gas Company for the approval by the Board of the contracts entered into between that Company, the New England Gas and Coke Company, the Waltham Gas Light Company and the Chelsea Gas Light Company. This will be the first hearing held by the Board on the question of contracts between gas companies, and is the result of the special act passed by the last legislature providing as follows:

"That the Boston Consolidated Gas Company shall not purchase any gas until the Board of Gas and Electric Light Commissioners has found after public hearing that the price to be paid for the gas to be purchased is less than it would cost said Boston Consolidated Gas Company to make its gas in gas works of standard type properly equipped, suitably situated and of sufficient capacity to make all the gas required by the whole district supplied by said Company."

WE herewith acknowledge the receipt of a copy of that sterling English annual, known the gas world over as "Field's Analysis," for which we are indebted to the courtesy of the compiler, Mr. George Orford, Assistant Accountant to the Gas Light and Coke Company, of London, who, as successor to the late Mr. John Field, the original designer of the work, has followed closely the scheme laid down by his predecessor. The "Analysis" at hand has to do with the accounts of the principal gas undertakings in England, Scotland and Ireland for the year 1904, and the only criticism that may be offered regarding its merits is that it would not seem possible to point out where its value could be increased.

WE understand that all the preliminaries have been completed for the absorption by the Toledo (O.) Gas Light and Coke Company of the Toledo Heating and Lighting Company. Under the agreement the succeeding corporation is to be known as the Toledo Gas, Electric and Heating Company, with a bonded indebtedness of $2,500,000, and a stock capitalization of $2,500,000.

[OFFICIAL REPORT.—REVISED BY THE SECRETARY.—CONTINUED FROM PAGE 51.]

TWENTY-EIGHTH ANNUAL MEETING, WESTERN GAS ASSOCIATION.

HELD AT CHICAGO, ILLS., IN THE AUDITORIUM HOTEL, MAY 17, 18 AND 19.

FIRST DAY—AFTERNOON SESSION.

PROPOSED GAS ENGINEERING COURSE.

The President—It has been brought to my attention that we have with us, and I am glad to say as new members, Prof. F. E. Turneaure, Dean of the College of Engineering, and Prof. Charles F. Burgess of the College of Engineering, University of Wisconsin, at Madison. They are starting a gas engineering course in that University, and I think we would all like to hear from Prof. Turneaure as to what they propose in connection with the course.

Prof. Turneaure—Mr. President and Members of the Association, I don't know that I can say as yet what we are going to do. That is what I came down here to find out. I am very glad to be able to become a member of this Association, and in the enterprise that we are entering upon at the University of Wisconsin I expect a great deal of help from your membership. We expect next year to inaugurate at Wisconsin, on a small scale to start with, some work which will lead up to instruction along the line of gas engineering. Just exactly what that means seems to be difficult to find out, even among those who are prominent gas engineers. We shall not begin on a very large scale, but hope to build up the instruction on solid, substantial grounds, and not attempt to turn out consulting gas engineers after four years' of school. I can only say again, I thank you very much for permitting Prof. Burgess and myself to join the Association, and I trust we will get a great deal of good from our membership. (Applause.)

The President—Will Prof. Burgess favor us with a few remarks?

Prof. Burgess—Mr. President, I shall have to be excused at this time. I hope that next year, or later, I shall have an opportunity to address you.

A CALL FROM IOWA.

The Secretary—Mr. President, before we read Mr. Chollar's paper, I wish to make the following announcement: Members of the Western Gas Association from the State of Iowa are requested to meet in Room J, 14, Auditorium Annex, immediately following the adjournment of this meeting, for the purpose of perfecting a State organization.

GEORGE B. MCLEAN,
L. L. KELLOGG,
JANSEN HAINES,
} Committee.

The President again called attention to the fact that the photographer was ready to take a picture at the close of this session, and that anyone who wished to be photographed should remain until the close of the afternoon proceedings.

The President then announced that the next paper on the programme was that by Mr. B. E. Chollar, of Kansas City, Mo., on

THE EVOLUTION OF THE ENGINEER.

Owing to Mr. Chollar's absence, the paper was read as follows by Mr. W. E. Steinwedell:

I am asked to prepare something about the engineer—not an essay on engineering, its history or its practice, especially, but a little about the engineer in general; the whence of the engineer; the why of the engineer; the how of the engineer; the now of the engineer, and the hence of the engineer.

The "Century Dictionary," in defining the words engineer, engineering, etc., says in part as follows: Engineering (verbal noun of *engineer*), the art of constructing and using engines or machines; the art of executing civil or military works which require a special knowledge of machinery, or of the principles of mechanics; careful management or maneuvering. (See engineer, verb.)

Engineer (verb) to plan and direct the formation of; to direct as an engineer; as, to *engineer* a canal or tunnel. To guide or manage through or over obstacles by contrivance or effort; as to *engineer* a bill through congress. (See engineer, noun.)

Engine (noun) from the Latin *ingenium*, innate or natural quality; genius; a genius; an invention; in later Latin, a war engine; a battering ram. In old and obsolete English, innate or natural quality; ingenuity; craft; skill. Chaucer says: "I ne userpe not to have founden this werke of my labour or of myne *engin*." Puttenham, also: "Such also as made most of their works by translation out of the Latine and French toung and few or none of their owne *engine*."

A later meaning but still obsolete is an artful device or contrivance;

a skillfully devised plan or contrivance or method, a subtle artifice. A more modern meaning is: An instrumental agent or agency of any kind; anything used to effect a purpose; an instrumentality.

"An age when the Dutch press was one of the most formidable *engines* by which the public mind of Europe was moved."—Macaulay.

An apparatus for producing some mechanical effect; especially a skilful mechanical contrivance.

Thus far in the early use of the word *engine* the connection between natural born ability and war engines and battering rams is not clear. The Bible, however, sheds light on the matter. The 26th chapter and 15th verse of Second Chronicles (speaking of King Uzziah) says: "And he made in Jerusalem engines, invented by cunning men, to be on the towers, and upon the bulwarks to shoot arrows and great stones withal." The word cunning in the time of King James I. had a more respectable meaning than it has at the present time. Cunning is literally knowing, and especially knowing how. It is from the same origin as the word can (in obsolete form con or to con), to know; later to know how to do; to be able to do.

Hence we may infer that the original engineer was a man of natural ability and who knew how to do things. His principal work in early times was probably to furnish brains for kings, to show them how to win their battles, to fortify and capture cities, to build their roads and bridges, and to move their armies.

The civil engineering of the ancients was not great. The demand for transportation was small, yet they built canals, but knew nothing of locks; they knew little of mechanics and less of hydraulics. They had no big pumps, hence no big mines. They built aqueducts and ditches, but knew little about the flow of water

The ancient speculative philosophers were not conducive to the development of technical engineering. Their philosophy was mental gymnastics. They didn't experiment. They asserted, but did not prove. They generalized and concluded from individual cases. They reasoned, each man for himself, and there were about as many kinds of philosophy as there were of philosophers. One man, for instance, thought there were 4 primal elements. Another thought water to be the ultimate matter, while another didn't believe it was water but was air, because air gives life and is infinite. Democritus thought the world was made of ultimate atoms, but the atoms that Democritus had in his mind were not the atoms of Dalton.

The ancient philosophers were thrifty; they taught for money. They got as many pupils as possible, and tried to make them believe as they did. Their thinking power was immense, but it was not the power of doing things. They lacked the how, and were not engineers. Fortunately there were a few men of another kind. Archimedes did things. He was an engineer, a military engineer. He was engineer-in-chief to the king, and helped to defend Syracuse from the Romans. He experimented. He found out not only that the king's crown had been "faked," but also how much silver had been substituted for gold. He invented the lever, and offered to take the contract to move the earth provided somebody would find him a place to stand. The mediæval philosophers were as bad as the ancients. The scholastics held sway for 1,000 years. They argued and argued; they fought and fought—they worse than fought, they "scrapped" about the difference between tweedledee and tweedledum, and the world was no better off for them.

During the 15th century things took a change for the better. Copernicus found out for sure that the earth and planets revolve round the sun. He knew how to do it, and did it. He was an engineer; not a technical engineer in the modern sense, but he was a great engineer all the same. Kepler verified Copernicus, and demonstrated the three great laws. He knew how to do things, and was the greatest of all engineers up to his time.

Galileo was an engineer. He did things. He discovered the moons of Jupiter, worked out the pendulum, confirmed Copernicus, and helped Newton on his way to the law of gravitation. Boyle and Mariotte were engineers. Torricelli was an engineer. He found out what makes a pump work, and Pascal verified him. The 16th and 17th centuries were great for doing things. The road to modern technical engineering was built during that time. Everybody that knew anything seemed to be at work.

Bacon, though not a scientist, was the grandest engineer of all. It was left to him to reorganize philosophy, and put it on a dividend earning basis. Before his time physical science was sporadic and desultory. Bacon held that all science is physical science, and is based upon experiment. Conclusions drawn from experiment, although they may be false and fail even in the long run, will lead to other and similar conclusions, so that in the end the errors will correct themselves, and finally the true conclusions will be arrived at. A few had used methods similar to Bacon's before his time, but Bacon completed and published the inductive method to the world.

The greatest of all great engineers in the modern sense of the word was James Watt, who produced that mighty engine that started the wheels of industry agoing and which will keep going as long as time lasts. He made all engineering possible. He did more; he made the impossible not only possible, but easy. Words fail to detail and the human mind fails to comprehend the good that the invention of Watt did for civilization. Watt furnished the mechanical power, and that other gigantic engine, the joint stock company, backed by the brains of the business engineer, furnished the financial power that has moved the world.

Up to Watt's time the universities and colleges recognized only three learned professions—Law, Theology and Medicine. Law was present practice of past experience. Theology was present consideration of the future state. Medicine was the practice of making people think they know all about something that they know very little of. Attorney means proxy, priest means an old man, and doctor means a schoolmaster. They were not engineers; they did not do things. The modern physician and surgeon are engineers; the physician is a natural philospher, and the surgeon is a hand worker. There was a demand for trained engineers who could not get their education at the colleges, but had to go elsewhere. The engineer had no standing then, but now, like Abou ben Adhem, "his name leads all the rest." For many years technical engineers were self-educated, but eventually the demand became so great that technical schools were established in Europe, and up to about 1825 an American who wanted a technical training had to go to Europe for it. The Rensselaer Polytechnic was established about that time, and was quickly followed by others. At the present time there are hundreds, but not enough. The great demand in this country for technically trained engineers dates from the time when iron could be produced profitably. The next great, and greatest demand came with the invention of the electro-magnetic dynamo. The technical schools are turning out young engineers by thousands, and yet the demand for good men exceeds the supply.

The young engineer must know how to do things and to do them well; to that end he must be educated. Education implies information, instruction, teaching, training and learning. By information you know more, by instruction you understand more, by teaching you learn to do things better, by training you learn how to act better. You can buy information, you can buy instruction, you can buy teaching, you can buy training, but you have to learn for yourself. You can't buy learning; you must work for it.

In these days, when the world is moving in geometrical progression, there is little chance for handmade education to compete successfully with the big educational engines. The student had better work at something else to enable him to buy his education than to attempt to make it himself. The technical schools have the instructors, the teachers, the trainers, the appliances; in fact, they supply everything except the work. If the would-be engineer has not got the innate ability he had better keep away from a technical school and take up some other line of business, or if he expects to succeed without hard work he had better keep out.

The colleges complain of the bad spelling of their students, and the technical schools complain that many of their graduates are unable to write a report in decent English. It behooves the student to get a good English education to begin with, and not to spend his time and money to get the three R's in a college. Work hard, but don't cram. Don't make notes on your shirt cuffs for examination. Nothing is hard when you understand it. The schools will push you too hard and you must work all the harder for it. Don't think you are educated the moment you get your diploma; you will have then only found out how little you know. Diploma means a folded paper. A diploma is only a letter of recommendation. Be careful how you use it, lest you cast discredit on the giver. You will probably use it only once; the next time you will try for a letter from the "boss." It will be better. Keep on reading and studying. You will forget your information but not your knowledge.

An engineer is not much of an engineer when he is only an engineer and nothing more. He must be an engineer and a good deal more. An engineer is the man who knows how to do things and many things.

Discussion.

The President—Gentlemen, any discussion upon this paper? Being of a philosophical nature, possibly it does not admit of very much discussion.

Mr. Magee—Is it in order for a visitor to say a word here?

The President—We would be very glad to have you do so, Mr. Magee.

Mr. Magee—I would like to know what the opinion of the engineers present is on the engineering courses offered in correspondence schools. There are a great many young men who have had no opportunity for a technical education, some of whom have hardly a high school education, and yet they want to learn more about the inside of the gas business. Some of them are thinking of taking up the correspondence school courses. I would like to have an expression from the engineers here as to the value of those courses.

The President—I think Mr. Magee's question has quite a pertinent bearing upon this paper, and I would like to hear from some of the engineers present in regard to these correspondence schools that Mr. Magee is inquiring about. Mr. Doty, will you give your opinion on the subject?

Mr. Doty—It is rather difficult to express an *ex cathedra* opinion, or an opinion based absolutely upon the facts. I have had some experience with correspondence schools, and especially in directing young men who have taken their work. I think in general they are good. Of course, it can safely be said that there is room for improvement in them. It was rather difficult sometimes to get exactly at the work these correspondence schools are trying to do, so far as their application to gas engineering is concerned, but I am a firm believer in education generally, and all education is good. It seems to me almost impossible to get education, even by these correspondence schools, that is not good. The American Gas Light Association is conducting a Correspondence Class in gas engineering which, to my mind, is far superior to the work that is carried on by the correspondence schools. The work is directed with much more intelligence; I think that there is less padding. The chief objection I have to the correspondence school instruction papers that I have seen is so much padding; but that may be necessary. They probably knew the class of students a great deal better than I do. It seems to me that young men can get information from the Correspondence Class of the American Gas Light Association that will be far more valuable to them than they can get from the correspondence schools such as I imagine the gentleman has in mind; but I would not let the impression get out that I discourage any of the schools. The correspondence school is better than nothing. If you cannot get the advantages of the Educational Class of the American Gas Light Association, take up the work of the correspondence schools. It probably will cost you more money, and you will be longer in getting the information you want; but the mere fact that you are trying to do something will lead on to something better, and you will soon get a grasp for yourself from your association with the industry, if you are engaged in the industry, and from association with the men who are doing the work in the industry, that will lead you on and up. I think we are greatly indebted to Mr. Chollar for his paper. As the President has said, it is to a certain extent a philosophic paper. We who know Mr. Chollar know him as an engineer of ripe experience and mature judgment, and he is an engineer in the sense of the man who does things. Mr. Chollar, more than that, is an engineer by diploma. It is not necessary for me to state that Mr. Chollar graduated from the University of the City of New York shortly before the Civil War, and rendered services to his country during the war in the engineering corps. This we know. He has spent a lifetime in engineering work, and has freely given of his knowledge, freely made sacrifices of his time, for the advancement of Association work. I believe Mr. Chollar has the proud distinction of being the man who has written the most papers for the different gas associations, and I am sure that we should give the greatest heed, pay the greatest attention to the wisdom, the ripe, mature wisdom, the good, kindly expressions, a man like Mr. Chollar can give us. It will be probably an encouragement for the professors who came here from the University of Wisconsin to know that there are in the gas industry engineers like Mr. Chollar, who can give their thoughts to us, and we can profit from the study and absorption of the thoughts given.

Mr. Norris—Regarding correspondence schools, I have naturally come more in contact with the work of the Correspondence Class of the American Gas Light Association than the correspondence schools such as that at Scranton, but it so happens that at one of our small works in New York State it seems to be the thing for our men to join that Scranton school. It may be a coincidence, and it may be the result of that, but that one little place has turned out more foremen for other works, more superintendents of little places, than I think all the rest of the Class put together. I don't know whether it is the influence of the superintendent there on those men, but I suppose he has half a dozen men right along who take the correspondence courses at the Scranton school, and it seems to be very effective in enabling those men to rise to a certain point. Of course, the work of the Educational Class of the American Gas Light Association is a little bit more ambitious than the courses taken by these men, and requires more study, and carries the men further in the long run. I thought this experience, such as it is, might have some bearings on Mr. Magee's question.

Mr. Forstall—In moving a vote of thanks to Mr. Chollar for his paper, I would like, with the permission of the Association, to ride a little hobby of mine for a minute or two. Mr. Chollar says it behooves the student to get a good English education to begin with. I think possibly I have expressed myself to this Association on the subject before; I certainly have to other Associations. To my mind, the great fault of the ordinary engineering education is its narrowness. It tries to teach a man a lot of stuff, if I may be allowed to call it so, which is supposed to be practical, and I have known quite a number of college students who objected to things in their course which were supposed not to have practical bearings after they got out of the university or the college. You will find, however, by looking over and reviewing the career of the successful engineers, that they have not been the men whom the college has attempted to train in a specialty; they are the men who before entering business life have had a broad training, that covered a number of subjects, and have specialized after they left college. For that reason I am always a little skeptical when I hear anybody advocate the starting of a course in gas engineering as an undergraduate college course. All that a good gas engineer or a good electrical engineer needs is a good course in mechanical engineering. Or I may go even farther than that and say that you can probably make a better gas engineer or a better electrical engineer out of a man who has had 3 years of an academic course, leaving out possibly the Greek and Latin, and then has taken 1 year or possibly 2 years of a mechanical engineering course, than you can make out of a man who, without any preparatory general education, has gone to a technical college and taken a strictly technical course of 4 years. I would like to move a vote of thanks to Mr. Chollar for his paper. [Seconded.]

The President—Before putting the motion, I wish to say that I am both surprised and pleased at the amount of discussion which the paper has brought forth, and at the thoughtful discussion that has been rendered on the subject of the engineer. [The motion was carried.]

The Secretary read the following

TELEGRAM FROM MR. H. L. DOHERTY:

James W. Dunbar, Secy. Western Gas Association: Much to my regret it will be impossible for me to attend the 28th convention. My best wishes for a highly successful convention, and a plea for favorable action on any matter which comes up aiming to secure better Association work, which will prove beneficial to the fraternity.

HENRY L. DOHERTY.

The President—Gentlemen, there being nothing further on the programme, we will now stand adjourned until to-morrow morning.

SECOND DAY, MORNING SESSION.

The Association reassembled at 10:35 A.M., Thursday, May 18, 1905. The President having called the meeting to order, announced that the Secretary would read a

SUPPLEMENTAL REPORT FROM THE BOARD OF DIRECTORS.

CHICAGO, May 18, 1905.

A meeting of the Board of Directors of the Western Gas Association was held at 10 A.M., Moy 18.

On motion of Mr. Doty, it was voted that Prof. Frederick E. Turneaure, Dean of the College of Engineering, University of Wisconsin, Madison, Wis., and Charles F. Burgess, Professor of Engineering of the same University. be transferred from associate to active membership.

On motion, the report was unanimously adopted.

The President introduced Mr. K. M. Mitchell, of St. Joseph, Mo., who read the following paper on

KANSAS OIL:

The story of Kansas will never grow old. Across its prairies have come strange tales in years gone by; political, religious, social revolutions have followed one another, sometimes with startling suddenness. Kansas has never failed the public with something new, something novel, something worth while. Many years ago it was "Bleeding Kansas." The writer recalls the time when he viewed wagon after wagon passing through St. Joseph (which is situated on one side of the Missouri river, with Kansas on the other side) into Kansas. I remember one wagon had painted on the side of the canvas-covered top the

following inscription: "Kansas or bust." Six months later the same wagon made its way back into Missouri with this inscription on the cover: "Busted by gum." Missouri took care of the refugees; gave them food and shelter.

Kansas, struggling a few years ago to pay off a heart-breaking load of indebtedness, is alive to-day with the hums of factory wheels, the flare of furnaces in foundry and glass plants, brick yards and smelters, flour mills, sorghum mills, cotton mills, operated at a cost for fuel infinitesimal when compared with those 200 miles away. Kansas has an oil and gas field larger and better than any west of Indiana, excepting only California. Kansas has the goods ready to deliver. The oil and gas belts run in a southwest direction across the southeastern part of the State.

Wilson county was the scene of the first oil and gas development. George W. Chase, a teacher in the Deaf and Dumb Asylum, at Olathe, in 1888, visited friends in Wilson county. Chase thought Wilson county likely to be the crust above great oil and gas deposits, and did all he could to awaken the interest of men with means, and while he failed to arouse the people of Neodesha, he accomplished the desired result in other counties. Gas was found at Cherryvale, in Montgomery county. In December, 1892, William M. Mills, of Osawatomie, discovered oil adjoining the town site of Neodesha, on the east.

He formed a partnership styled Guffey, Galey & Mills. They leased large tracts of land (700,000 acres) in Wilson, Neosho, Allen, Bourbon, Woodson, Elk and Montgomery counties. These leases were not much different from those made nowadays. They gave to the company the privilege of drilling on the land for 10 years; they provided for a royalty of 25 cents an acre each pear, to be paid if drilling was not begun within 2 years, and they contained a promise to pay the landowners one-tenth of the crude product stored in tanks. If gas and not oil developed, the land owner was to receive free light and fuel for domestic use and $50 a year for every well utilized by the lessees.

The first real valuable gas well drilled was in 1893, 3 miles northwest of Neodesha. Fifteen wells were drilled that year, 13 of which were oil producers. In 1895 they built 2 steel oil storage tanks, with a capacity of 35,000 gallons each. Into these tanks they piped the crude oil which had accumulated in numerous small tanks.

In 1895 Guffey & Galey were absorbed by a company known to the world as the Forest Oil Company, which was in reality the Standard Oil Company. In January, 1897, the Forest Oil Company became the Prairie Oil and Gas Company, and in the following June a refinery was built, which had a capacity of 500 barrels a day, and it treated the product of the company that owned it. The pumping was done with the "shackle-rod" system, a device arranged on the plan of eccentrics, whereby a dozen or more wells may be pumped from one wheel, the rods extending from all sides of the power house, and being supported on posts. One man could care for the engine, which burned gas. The farmer got his portion, but hardly fair compensation from the men who were making money while the farmers plowed and harvested the lands that were yielding independence to others.

The average depth of the well in Wilson county is 850 feet. From 2 to 3 weeks is required to drill, and the cost varies from $1,800 to $2,800, the latter figure including the string of tools.

The developments in the Chanute oil and gas fields are very extensive. The country is a forest of derricks, power plants and pumping stations. Mr. I. N. Knapp, a well known gas man, now of Chanute, Kas., is a large producer. He has over 80 wells producing oil. He furnished the Kansas City, Missouri, Gas Company, Kansas City Nut and Bolt Company, and the Omaha Gas Company with oil for a number of years. He said to the writer in a letter of May 1, 1901: "Kansas oils have no appreciable amount of sulphur, and in this respect are superior to oils from the Ohio field. There is no practical difference between the Kansas and Ohio oils so far as the enrichment of water gas is concerned. I have sold over 100 tank cars of oil for gas making purposes, and I know from analysis and working tests that the above statements are correct. Yours very truly, I. N. KNAPP."

The Prairie Oil & Gas Company began laying a large pipe from the oil fields in Kansas to its new oil refinery located at Kansas city, Mo. This line is now completed, and the refinery is in operation. The Prairie Oil & Gas Company (which is owned by the Standard Oil Company), laid its pipes to every producer who had a fair production of oil, paying them 31 cents to 72 cents a barrel, according to the gravity of the oil. Oil whose gravity was 22 to 28 brought 31 cents a barrel, and that with a gravity of 32 brought 72 cents a barrel. The result was that the production was tremendous—too great to be handled by the Standard Oil Company; then came a reduction in the price. Trouble began. The Legislature of the State of Kansas took a hand, and will build a State oil refinery. A number of independent refineries are now being built by the producers, who have banded together.

The Standard Oil Company will take only a portion of the highest grade of oil. The indications are that the producers will be compelled to purchase tank cars to transport the oil to the market, which will be sold for gas and fuel purposes.

The Webster Refining Company, of Humboldt, Kas., is an independent refiner of oil and has been doing business for 2 years. We have used the oil from this refinery since June of last year, and find the gravity to vary from 24° to 28°; 4.27 gallons of oil are required to produce 1,000 cubic feet of gas, with a candle power of 22. The coke used is 35.4 pounds; the analysis of the oil as made by the Laclede Gas Light Company, St. Louis, Mo., is as follows:

Distillation Test made March 9, 1905, *Webster Refining Company, Humboldt, Kas.*—Specific gravity of sample at 60° F., 27.3° B. Fraction 10 per cent. by volume.

			Sp. Gr. Baume.	
1st	Fraction	95° C.	160° C.	40.1
2d	"	160 "	190 "	
3d	"	190 "	250 "	32.5
4th	"	250 "	265 "	
5th	"	255 "	270 "	31.5
6th	"	270 "	278 "	
7th	"	278 "	305 "	30.5
8th	"	305 "	340 "	
9th	"	340 "	360 "	
10th	"			

Coke (by weight) 3.20 per cent. The last 3 fractions have an odor like kerosene.

Distillation Test made March 8, 1905, *on Oil from Neodesha, Kas.*—Specific gravity of sample at 60° F., 32.80° B. Fractions 10 per cent. by volume.

			Sp. Gr. Baume.	
1st	Fraction	95° C.	201° C.	52.1
2d	"	201 "	298 "	38.8
3d	"	298 "	320 "	33.9
4th	"	320 "	337 "	30.4
5th	"	337 "	350 "	29.5
6th	"	350 "		29.0
7th	"			27.9
8th	"			27.8
9th	"			27.0
10th	"			26.9

Coke (by weight) .98 per cent. The average sediment in a series of samples showed .72 per cent. by volume.

Distillation Test made about January 15, 1905, *on Oil from Neodesha, Kas.*—Specific gravity of oil at 60° F., 31.50° B. Fractions 10 per cent. by volume.

		Kansas Oil.		Indiana Oil.	
1st	Fraction	95° C.	200° C.	60° C.	175° C.
2nd	"	200 "	285 "	175 "	256 "
3rd	"	285 "	320 "	256 "	294 "
4th	"	320 "	330 "	294 "	315 "
5th	"	330 "	345 "	315 "	330 "
6th	"	345 "	360 "	330 "	337 "
7th	"			337 "	340 "
8th	"			340 "	360 "
9th	"				
10th	"				

Coke by weight, 77 per cent., 1 per cent. The 10th fraction of the Kansas oil is thick and on cooling turns to a vaseline-like mass.

Chilling Test.—When the oil is not agitated it stops flowing at 30° F.

When it is agitated: At 55° F. ..... begins to thicken.
" " " " 40 " ..... like molasses.
" " " " 30 " ..... " pastry.
" " " " 20 " (ab't) ..... ceases to flow.

Density Test.—

50° F.	31.0° B.
60 "	31.7 "
70 "	32.4 "
80 "	33.1 "
90 "	33.6 "
100 "	34.2 "

Distillation Test made March 10, 1905, *on Oil from Topeka, Kas.*—Specific gravity of sample at 60° F., 27.70° B. Fractions 10 per cent. by volume.

			Sp. Gr. Baume.	
1st	Fraction	70° C.	185° C.	49.2
2nd	"	185 "	254 "	40.2
3rd	"	254 "	290 "	34.0
4th	"	290 "	297 "	32.2

			Sp. Gr. Baume.
5th Fraction	297° C.	310° C.	30.1
6th "	310 "	328 "	28.8
7th "	328 "	330 "	28.0
8th "	330 "	330 "	27.9
9th "	330 "	360 "	27.9
10th "	360		27.6

Coke (by weight) 2.10 per cent. The last 5 fractions were light colored when first distilled, but on standing turned a very dark color.

Distillation Test made June 23, 1904, *on Oil from Whiting, Ind.*—Specific gravity of oil at 60° F., 35° B. Fractions 10 per cent. by volume.

			Sp. Gr. Baume.
1st Fraction	60° C.	175° C.	58.2
2nd "	175 "	265 "	44.5
3rd "	256 "	294 "	39.5
4th "	294 "	315 "	37.0
5th "	315 "	330 "	35 5
6th "	330 "	337 "	34.7
7th "	337 "	340 "	33.7
8th "	340 "	360 "	31.9
9th "			29.0
10th "			

Coke (by weight) 1 per cent.

Distillation Test made April 14, 1905, *on Oil from Indian Territory.*—Specific gravity of sample at 60° F., 32.8° B. Fraction 10 per cent. by volume.

			Sp. Gr. Baume.	
1st Fraction	85°	140°	39
2d "	140°	225°	
3d "	225°	285°	42
4th "	285°	316°	
5th "	316°	354°	32
6th "	354°	360°	
7th "	360°		28
8th "			
9th "			
10th "			

Coke (by weight), 1.82. Fraction clear.

The daily oil production in Kansas, before the Standard Oil Company curtailed its purchasers, was in the neighborhood of 25,000 barrels, oil of all gravities. The sales were only 8,500 barrels and this great surplus was stored in large tanks on the fields. The Standard Oil Company will now take only oil with a gravity of 30° and over. The low grade oil is not being purchased and the producers of oil of a gravity less than 30 are wondering what they will do with their production.

The President—Before discussing this paper we will hear the paper on Texas oil, by Mr. Thomas D. Miller. The two topics being so closely related, I think we had better discuss the two papers at the same time.

The President introduced Mr. Thomas D. Miller, of New Orleans, La., who read the following paper on

THE TEXAS OIL FIELDS:

"Petroleum, Captain? Yes, sir, the country was full of it. Isaac knew all about it. You read the Bible."—Mark Twain.

The existence of petroleum in Texas seems to have been mentioned as far back as 1860, when a small lake, within 100 miles of Houston, is described as filled with bitumen and having in its center a spring which discharged during the summer months an oily liquid, presumably petroleum.

Nacogdoches.—Oil in Texas seems to have been discovered by two hunters, in 1867, while on a hunting expedition at a point about 15 miles southeast of Nacogdoches. Subsequently a well was drilled about 1 mile west of Melrose, near the point of discovery referred to. A small quantity of oil was found in the first well drilled, but none in the second well, which was abandoned after having been sunk 80 feet. Later an 8-inch well was drilled and oil was struck at 70 feet. The first day the well flowed from 250 to 300 barrels and then ceased flowing. The company continued to drill wells until 1889, and from 1887 to 1890, ninety wells were drilled in Nacogdoches county, In 1890 there were 30 wells in this county, but the oil was found unsuited for the manufacture of illuminating oils. It was of a brownish red color with a peculiar odor not offensive to the degree that Pennsylvania oil is. It remained mobile at a temperature below zero Fahrenheit, and at no temperature obtainable in the laboratory at hand could solid paraffine be separated. A fractional distillation was made of this oil in a retort and the result is shown in the *appendix.* At the present time the Nacogdoches field has known considerable activity, but with no marked results in the increase of the production of oil.

In the State of Texas there are oil indications in 36 counties. Oil wells are in operation in 8 counties, and gas has been discovered in 31 counties in the State.

The oil of the Gulf coastal plain, which plain covers all the oil wells of southeast Texas, is propably derived in part at least from the action of decomposing matter, animal or vegetable, or both.

Mr. Robt. T. Hill offers this hypothesis for the Texas and Louisiana oil fields: "The oil and salt pools of Texas and Louisiana are not indigenous to the strata in which they are found, but are the resultant products of columns of hot saline water which have accumulated, under hydrostatic pressure, at points along lines of structural weakness, through thousands of feet of shale, sand and marine littoral sediments of the coastal plain through which oil and gas are disseminated in more or less minute quantities. The oil and sulphur may have floated upward on these waters, and the salt and dolomite may have been crystallized from the saturated solution."[1]

Corsicana.—Oil was discovered at Corsicana, sometime prior to 1894, by Major Alex. Beaton, in sinking an artesian well for a water supply for the inhabitants, and at 1,027 feet struck a vein of oil. This oil was cased off and the boring continued to 2,470 feet, when a good flow of warm water was reached. The oil, however, soon made its appearance through the soil, on the outside of the casing, and has flowed more or less ever since. With this evidence of oil, a company was formed and wells sunk. The wells vary in depth from 1,000 to 1,040 feet, to the top of the oil bearing sand, and the sand is from 10 to 40 feet thick. The oil rock is very regular and dips to the southeast about 1 foot to the 100 feet. After oil is struck it is usually about 24 hours before it reaches the surface. The oil is forced up by gas, and sometimes it throws the oil 100 feet clear of the ground.

In January, 1898, there were 65 flowing wells, and 6 dry holes had been dug—a fraction less than 10 per cent. The total production of these wells was about 900 barrels per day. The known field at this time was about 2½ miles by ¾ of a mile, and it lays northeast and southwest, about 20° to 22°.

The elevation of Corsicana is 427 feet above the sea, therefore, the oil bearing strata is something like 600 feet below sea level. The drilling is entirely through Ponderoso marl, and the oil bearing rock is a soft, gray shale, and can hardly be called a sand. The Corsicana field produces two grades of oil; a light and a heavy oil. The light oil is suitable for distillation and the production of commercial burning oils and gasoline and is worth on the market nearly double the heavy oil production from the same field. As a gas oil the lighter grade gives very satisfactory results, and yields from 5.50 to 5.75 candles per gallon of oil used, and as high as 32-candle power gas has been made. Two extensive plants for the utilization of this oil have been in operation for several years in the vicinity of this field.

From the time of the discovery of oil at Nacogdoches up to the opening of the Corsicana field many wells were drilled for water or oil throughout the State, and many wells are reported as having small traces of oil.

Beaumont.—In 1892 a company was formed for the purpose of drilling for oil, gas or anything else, in South Texas, and a well was sunk to a depth of 300 feet near Gladys City and but a short distance from the point where the now famous Lucas gusher was brought in. The company was organized by Mr. Patilo Higgins, who was later identified with the Higgins Oil and Fuel Company, a going concern in Texas to-day, and the failure of the first well near Gladys City is attributed to the lack of knowledge in drilling. Mr. A. F. Lucas, who had extended experience in boring wells in the Salt District of Louisiana, began drilling on the famous Spindle Top the latter part of 1900, and at a depth of 1,130 feet brought in the famous Lucas gusher on January 10th, 1901. The oil came up with terrific force, and rose to something like 300 feet above the ground. Its violence was such that it carried with it 12,000 pounds of 4-inch pipe and practically wrecked the heavy derrick and tackle, showering rocks and sand with its first flow. The well is estimated to have yielded about 250 barrels per hour from the start, and rapidly increased until it was estimated that 75,000 barrels per day were coming to the surface. After flowing for 9 days the well was successfully capped. It would require the skill of the greatest writers of the day to describe the excitement that immediately followed the development of the Lucas well. Thousands of people rushed to Beaumont, Gladys City and Port Arthur and taxed the accommoda-

1. For a complete discussion of the geology of this section, I would refer you to bulletin No. 22, of U. S. Geological Survey; also to bulletin No. 1, of University of Texas Mineral Survey.

tions of all these places beyond their capacity. Buildings were hurriedly erected and a mushroom city appeared to be followed by the substantial buildings which to day testify to the prosperity of the Spindle Top yield. Gusher after gusher followed and many dry holes were bored. At one time it was estimated that the Beaumont district was yielding no less than 500,000 barrels of oil per day, which production was in excess of the entire yield of oil of the world.

Spindle Top heights is a low ridge of land about 30 feet above the level of the surrounding prairie at its highest point and is approximately 1 mile wide and 2 miles long, its greatest dimensions bearing about northeast, southwest. The Lucas gusher is situated near the south end of this ridge. It is regarded by geologists as probable that this rise of ground is due to the flexure of the strata forming the earth's crust, but it is possible that erosion may have been instrumental in the shaping of its topography.

With the enormous production of oil the result of the rapid development of the Texas field, the large investments that were necessary to take care of this immense product required time for organization and construction of plants for its storage and utilization. The fuel consumption began about the first, and millions of barrels of oil have been used under boilers. In the appendix will be found a statement of the heating value of these oils.

The Southern Pacific Railway, which passes through Beaumont, was one of the first to utilize this oil for boiler purposes, and the practice has become so general that the train men now distinguish an oil burning locomotive from a coal burner as a "breech loader or a muzzle loader."

Sour Lake.—A well was sunk in 1885 at Sour Lake, since quite a noted oil field. This well gave a heavy lubricating oil, 16° Baume. This well at Sour Lake later on prompted a wild rush for that territory after the Spindle Top developments.

In June, 1901, the Guffey Company began drilling at Sour Lake and at 900 feet struck a gas pocket. Later, in 1903, the Sour Lake district was developed and nearly 9,000,000 barrels of oil were produced in that year.

Saratoga and Batson.—Saratoga and Batson districts are in close proximity to Sour Lake, as will be seen on the accompanying map, and developed almost simultaneously with Sour Lake.

Humble.—This field has been much in the eye of the oil world for the past few months. Much was predicted for it, and on January 7th last, the first true gusher was brought in and started off at the rate of 8,500 barrels per day.

The oil from this well is very dark and approximates 22° gravity. It shows enough paraffine upon test to justify calling it a paraffine base oil as distinguished from the asphaltic base product in the other southeast Texas fields. The Humble field was the victim of an inrush of salt water early in March and the production dropped from 93,000 barrels per day to 25,000. This condition, however, gradually improved after a few days. This experience of salt water had the effect of raising the price of oil just as the appearance of a gusher tends to lower the price. Oil stored at Humble, April 30th, 1905, was 2,750,000 barrels.

The experience of the several gas companies with gas oil distillate from Texas oil for water gas production would seem to indicate that this oil runs about 28° Baume, although 24° and 27° oil has been used. One plant has used it for 3 years and says that the distillation tests show that 3 per cent. distills under 350° F., while 5 per cent. remains at a temperature of 630° F.; the distillate contains less than 0.5 per cent. sulphur. The working results have been entirely satisfactory, although the gas requires slightly more careful treatment in cold weather. A report from another works says that after a year's use the Texas solar oil has been found to give good results, is uniform in quality, clean and with little odor. It states that it may require but from 5 to 7 per cent. more oil to obtain the same candle power as when using the best Pennsylvania product. Another large company has been using this oil for 2 years, has never had any trouble with it, and declares that it is very satisfactory. Its gas making efficiency is very slightly less than Pennsylvania oil and somewhat more tar is produced, but they find it pays to use it. Another company says the oil is uniformly good quality.

The Beaumont crude oil has been used at the New Orleans plant for several years past, and the result of 1 month's average is: Candle power, 23.60; candles per gallon of oil used, 5.74.

About one-half of the gas in New Orleans is sent out under high pressure, that is, 25 to 30 pounds. An examination of candle power of the compressed gas shows hardly any appreciable reduction which might not be accounted for in various ways, and similar results were obtained as to heating value as shown by the Junker calorimeter.

The following statistics show the actual number of producing wells in each of the fields, as of February 1st, 1905, the gross daily production and the avesage daily production per week:

Field.	Gross Production.	No. Wells.	Av. Bbls. Well.
Batson	11,000	256	43 —
Sour Lake	11,450	103	111 +
Saratoga	20,135	38	530 —
Spindle Top	5,730	100	57 +
Humble	9,310	4	2,327 +

There are 8 companies engaged in the business of piping oil in the southeast Texas fields, representing 513½ miles of pipe line—4-inch and above. The mileage represented by each Company follows:

Summary of Pipe Line Mileage; Public Service Companies.

The Texas Company	126 miles.
The Sun Company	38½ "
Total (32 per cent. of all)	164½ "

Private Purpose Companies.

J. M. Guffey Petroleum Company	135 miles.
National Oil and Pipe Line Company	18 "
United Oil and Refining Company	30 "
Higgins Oil and Fuel Company	22 "
Security Oil Company	126 "
Raywood Rice Company	18 "
Total (68 per cent. of all)	349 "
Total mileage in all	513½ "

The storage charges in the Southeast Texas field are 33⅓ cents per day per 1,000 barrels, or 1 cent per barrel per month. Pipe line charges vary according to point from which oil comes and to which it goes from 3 cents to 15 cents per barrel. There is a dockage charge at Port Arthur of 1 cent per barrel for the first 5,000 barrels, and ½ cent per barrel for all over that at one loading.

The following quotation is from the *Oil Investors' Journal*, February 18, 1905:

"The J. M. Guffey Petroleum Company on February 14th announced that the charge for piping oil from Humble to Spindle Top would be 25 cents a barrel, and from Humble to Port Arthur 27 cents a barrel. The 6-inch pipe line from Humble to the Trinity river, laid by the Texas Company, is 26.5 miles in length. The Guffey line from the Trinity river to Sour Lake is 25.8 miles long, and the line from Sour Lake to Spindle Top (Lucas station) is 22.9 miles long, making the total length of line from Humble to Spindle Top 75.2 miles. The distance from Spindle Top to the docks at Port Arthur is 14.1 miles, therefore, the charge of 27 cents from Humble to Port Arthur covers a distance of 89.3 miles, and is at the rate of less than ½ of a cent a mile per barrel. Arrangements are underway for a test of the Humble-Sour Lake line, which has just been completed. It will be in operation within a very few days."

A large number of earth storage tanks have been built in these suddenly developed gusher fields. A shallow depth of water is placed in them and the oil is then floated on top of the water. This prevents the loss of oil by seapage into the earth bottom, the only portion of oil coming in contact with the earth being at the sides of the tanks. This water stratum is maintained by rains or pumping in fresh supply when necessary.

Some idea of the growth of the production of oil in Texas for the past 10 years can be obtained from the following table:

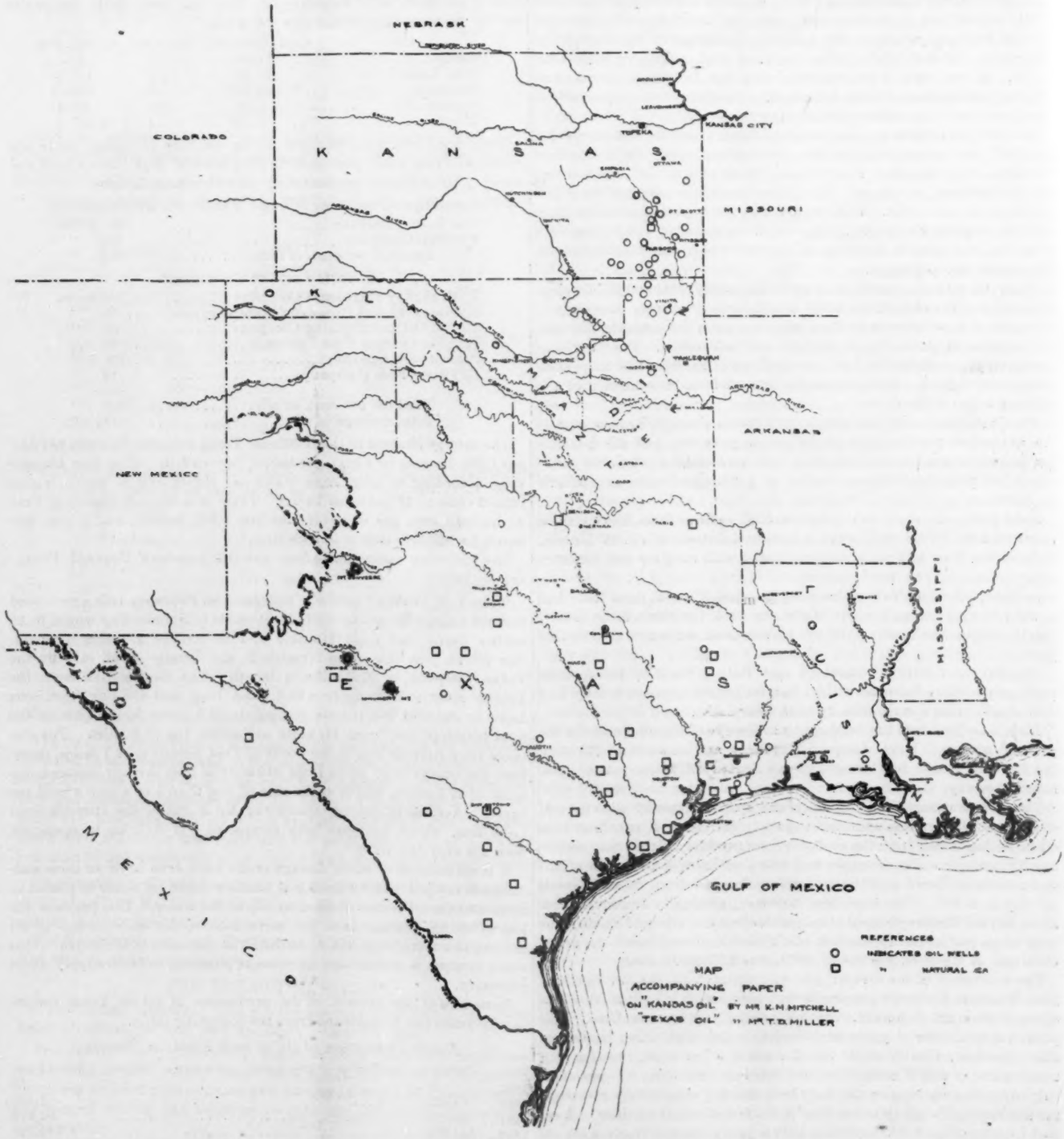
Entire Production of Oil in each Field, in Barrels.

Year.	Corsicana.	Spindle Top.	Sour Lake.	Saratoga.	Batson.	Grand Total.
1895..	50	.....	.....	.....	.....	50
1896[1].	1,450	.....	.....	.....	.....	1,450
1897..	65,975	.....	.....	.....	.....	65,975
1898..	544,620	.....	.....	.....	.....	544,620
1899..	668,483	.....	.....	.....	.....	668,483
1900..	829,560	.....	.....	.....	.....	829,560
1901[2].	763,424	3,593,113	.....	.....	.....	4,356,537
1902..	571,059	17,420,949	.....	.....	.....	17,992,008
1903..	401,817	8,600,905	8,848,159	75,000	4,518	17,530,339
1904..	503,647	2,828,150	5,707,500	704,350	10,204,700	19,947,947
	4,350,085	32,443,117	14,555,679	739,350	10,208,818	62,337,969

Rank of Texas as an Oil Producing State for the Past ten Years.

1895	12th
1896	8th
1897	9th
1898	7th
1899	7th
1900	7th
1901	6th
1902	2nd
1903	3rd
1904	3rd

1. Corsicana field opened up. 2. Spindle Top opened up.



In the older fields of the North the formation is wholly different from that of Texas and the Southwest. In the North a well that will start with a production of 100 barrels per day is the rare exception, but such wells continue to produce oil in paying quantities for years. In many of the fields the producing life of such wells is as much as 10 years, and they have been known to produce for more than 20 years. In the southeast Texas fields, wells that start at 10,000 barrels per day, or more are common; on the other hand the life of such wells is usually short. The gusher conditions seldom continue longer than 3 to 6 months, and only a small percentage of the wells drilled can be operated profitably as pumpers, and judging by experience so far, the life of such a pool would end in 3 years, and may end in 6 to 12 months, producing during its life several million barrels of oil.

The following estimate of Mr. J. S. Cullinane shows the investment of the oil industry of Texas, covering the period from January 1st, 1901, to December 31st, 1904:

Drilling 5,000 wells	$9,091,500
Equipping wells	1,849,000
Construction of pipe lines	2,743,000
Construction of 10,015,000 barrels of steel tankage	2,503,750
Construction of 10,193,000 barrels of open ground storage	1,325,090
Construction of 7,232,000 barrels of covered ground storage	1,224,540
Construction of 650,500 barrels of wooden tankage	260,200
Investment in refineries	8,750,000
2,000 tank cars, at an average of $1,200 each	2,400,000
50 steamers and barges, used in oil trade exclusively	6,000,000
Total	$36,151,980

By way of illustration of the great benefits Texas has gained by the development of the oil industry, the following comparative statements of world's production of coal and oil, the United States and Texas (1903) serves admirably:

Coal.

World's coal production (short tons)..... 967,858,406
Coal produced in the United States (short tons).....350,357,416
Coal produced in the State of Texas (short tons).... 926,759

Amount produced by the United States equaled 37 per cent. of the world's coal production. Amount produced by Texas equaled 3 per cent. of the total production of the United States. In production of coal Texas ranks 23d in the United States. Value of coal produced by the State of Texas, $1,505,383.

Oil.

World's oil production (barrels).....195,203,511
Oil produced in the United States.....100,461,337
Oil produced in the State of Texas..... 17,955,572

Amount produced in the United States equaled 51.46 per cent. of the world's oil production. Amount produced by Texas equaled 17 87 per cent. of the total production of the United States. In production of oil Texas ranked third in the United States. Value of oil produced in the State of Texas, $7,517,479.

In connection with the Texas oil fields it will be impossible at this date to fail to mention the Louisiana oil fields at Jennings and Welsh. The Jennings field is credited with the production of 6,609,000 barrels in 1904, while in 1903, 918,000 barrels were produced, and in 1902, 548,000 barrels were credited to the Jennings field, and for the year 1904, Louisiana as a petroleum producing State stands 7th on the list. Jennings oil is lower in sulphur than Beaumont, and is not as well adapted to manufacture of commercial distillates. It is excellent as a crude oil for gas making, and results obtained are fully equal to those from Beaumont oil, with less work for the purifiers. Indications are that the gas produced from this oil is more stable than that from Beaumont and Sour Lake.

The results from this crude oil for gas making show on a month's average: Candle power, 23 84; candles per gallon of oil used, 6.11.

The oil bearing sand in this district is an unconsolidated, coarse grain sand, lying at a depth varying from 1,800 to 2,200 feet. More or less gas companies use these wells, but there is no such pressure as is found at Spindle Top. At this time pipe lines are being laid to navigable water, when cargoes can be floated to tide water, the only facilities for shipment from Jennings at this time being the Southern Pacific Railroad. The result of the great excitement which followed the rush to the oil fields of Texas, and the formation of oil companies by the hundreds for the development of oil wells, and in many instances for the gathering in of the dollars of the masses, is very graphically illustrated in the "Answers to Inquiries" column of the "Oil Investors' Journal," a Beaumont publication:

The.....Oil Company. In the morgue.
The.....Oil Company. Owns an interest in some Batson production; also interested in a wild cat well drilling 7 miles from Welsh, La.; making expenses, has a small sum in bank, and owes nothing.
The.....Oil Company. Occupies a large block of ice in the morgue.
The.....Oil and Gold Company. There's nothing in a name. Also in the morgue.
The.....Oil Company. Same place.
The .....Oil Company. Morgue.
The.....Oil Company. Not operating.
The.....Oil Company. Not operating.
The.....Oil Company. Not operating. Ad libitum.

And perhaps in many instances, if the truth were known, they have gotten beyond the point where ice could preserve them.

Note.—I desire to acknowledge my indebtedness for assistance and information in compiling the foregoing paper to J. S. Cullinane, J. M. Guffey Petroleum Company, Higgins Oil and Fuel Company, "Oil Investors' Journal," "Progressive Age," "Texas State University Bulletin."

APPENDIX.

Analysis of Nacogdoches Oil.

	Per Cent. by Weight.
Below 300° F	0.04
300 to 345 "	0.37
345 to 390 "	1.38
390 to 435 "	2.09
435 to 480 "	3.14
480 to 525 "	6.25
525 to 615 "	7.07
615 to 680 "	5.63
Remaining in the retort	74.03

Analysis of Oil from near Waco, McClennan County. Specific gravity at 78° F; 0.836 B.

Fractions by distillation:

Below 250° F	1.14 per cent.
Between 250 and 400°	1.25 " "
" 400 " 500°	11.67 " "
" 500 " 520°	28.36 " "
Total below 520°	41.42 " "

Corsicana oil from a well near center of field, fractional distillation made by Mr. E. H. Earnshaw, Chemist for the U. G. I. Company. Oil very dark brown and opaque, but thin, and fluid at 60° F. Specific gravity at 60° F. = 39¼° B. = 0.8292.

Temperature Deg. F.	Per Cent. by Vol.	Per Cent. by Wt.	Degrees. Baume.	Sp. Gr. at 60° F.	Color Etc.
A-130 to 200	2.80	2.24	80 0	0.6653	Colorless.
B-200 to 250	5.10	4.31	69.5	0.7014	"
C-250 to 300	7.60	6.69	61.75	0,7302	"
D-300 to 350	8.20	7.44	56.00	0.7527	"
E-350 to 400	9.40	8.75	51.25	0.7718	"
F-400 to 450	7.40	7.07	46.75	0.7920	"
G-450 to 500	8.30	8.09	43.00	0.8088	"
H-500 to 550	6.45	6.43	39.50	0.8260	Very faint yellow.
I-550 to 600	7.75	7.85	36.50	0.8404	" " "
J-600 to 650	14.95	15.43	33.50	0.8555	Yellow
K-650 to 665	17.25	18.07	31.00	0.8687	Deep reddish yellow
L-over 650	1.30	1.41	26.00	0.8972	Deep red solid
M-over 650	1.40	1.63	14.50	0.9699	Dark red brown solid
Residue....	....	2.63	....	....	
Total	97.90	98.04	....	....	

Beaumont Crude Oil Received July 10, 1901. Color dark green. Specific gravity, .9196 = 22.22° B.; fluidity, thick.

Fraction No.	Tem of Dis	Per Cent by Volume.	Per Cent. by Weight.	Sp. Grav. Direct	Baume.	Des. of Fraction..	Resume.
1	200° F.	Water / Oil	Water / Oil				Water 212° F. .....per cent.
2	180-250	Oil 2.4	Oil 2.92	.7760	50.4	Light canary	Naphthas. 180° 30° F. 3.7 per cent.
3	250-300	1.3	1.01	.7967	45.7		
4	300-350	2.3	2.08	.8340	37.9	to	
5	350-400	2.4	3.15	.8335	34.0		Burning oil. 302°-572° F. 56.7 per cent.
6	400 450	6.8	6.39	.8654	31.8	Canary.	
7	450-500	15.1	14.45	.8804	29.0	Light brown	
8	500-550	17.5	17.10	.8991	25.7	to	
9	550-600	23.2	22.87	.9068	24.4		Asphalt oils 572° 810° F. 34.6 per cent. Coke. By Wt. 3.24 p. ct.
10	600-650	17.3	16.84	.8955	26.3	Dark brown.	
11	650 700	2.8	2.87	.9434	18.4		
12	700 810	2.9	3.21	.0193	2.7	Deep brown.	
Coke			3.24				
Tot'l		95.00	95.23				

Beaumont Oil Received August 19, 1902 Color, dark red; specific gravity, .9336-20.0° B; water, trace.

Fraction No.	Tem. of Dis.	Per Cent. by Volume.	Per Cent. by Weight.	Sp. Grav. Direct	Baume.	Des. of Fraction.	Resume.
1	200° F.	Water Oil. Water	Water Oil Water				Water 212° F. Trace per cent. Naphthas
2	200-259	Oil .6	Oil				200-302° F.
3	250 300	.9	1.79	.8385	37.0	Apple green.	15 per cent.
4	300 350	.5					
5	350-400	2.6	2.37	.8533	34.1	Canary	Burning oil 302° 572° F. 39.7 per cent.
6	400 450	5.7	5.30	.8681	31.1		
7	450-500	7.9	7.45	.8803	29.0	Chrome yel.	
8	500 550	12.9	12.32	.8912	27.1	Spruce.	
9	550-600	20.2	19.55	.9039	24.9		Paraffine oils 572°-730°F. 56.3 per cent. Coke By Wt. 4.02 p. ct
10	600 650	33.4	32.44	.9067	24.4	Terra Cotta.	
11	650 700	8.8	8.79	.9325	21.0	Bronze green	
12	700-730	4.0	4.06	.9473	17.8	Dk. " "	
Coke			4.02				
Tot'l		97.5	98.09				

Analysis of Petroleum from Sour Lake, Hardin County, Tex.

Fraction.	Temperature Degs. F.	Per Cent. by Volume.	Specific Gravity.	Color, Etc.
1.....	....	....	....	....
2.....	212–266	0.07	....	Yellow.
3.....	266–320	0.03	....	Yellow.
4.....	320–392	1.59	0.684	Yellow.
5.....	392–572	19.49	0.840	Yellow; blue fluorescence.
6.....	....	....	....	
7.....	572–641	5.15	0.782	Dark yellow.
Residue.	....	71.11	0.978	Black.
Total..	....	97.44	....	

Analysis of a Gas Oil.

Made from Beaumont crude oil, ordered by New Orleans Lighting Company. Description: Clear, free from suspended matter; color, dark brownish black; sp. gr., .8914-27.0° B.; water by volume; flash point, 179.6° F.; sulphur by weight, 2.1 per cent.; burning point, 212° F.

Fraction.	Temp. Dist.	Per Ct. Volume.	Per Ct. Wt.	Sp. Gr.	Gravity Beaume.	Des.	Resume.
1....	—200°F.	....	....	....	....	....	Naphthas.
2....	200 250	....	....	....	....	....	—302° F.
3....	250 302	—Trace.—		....	....	....	Trace.
4....	302 350	2.6	2.32	....	....	thin.	Burning oils.
5...	350 400	3.7	3.35	.8161	43.9	light.	302-572° F.
6....	400 450	8.5	8.04	.8452	36.7	straw.	Per ct. wt. 56.39
7....	450 500	15.5	15.08	.8676	31.3	medium.	Per ct. vol. 57.68
8....	500 550	16.63	16.39	.8871	27.8	amber.	
9....	550 472	10.75	11.21	.8915	27.0		
10....	572 600	3.38	3.63	.9015	25.25	me. amber.	Paraffine oils.
11...	600 650	10.5	10.76	.9126	23.5	dk. amber.	572–700° F.
							Pr. ct. wt. 41.21
12....	650 700	26.1	26.82	.9209	22.0		Pr. ct. vol. 39.98
13....	700		3.06	semi-solid black lustrous coke.			
		97.66	100.66				Pr. ct. wt. 3.06.

Log of the Lucas Well.

The first one to strike oil in depth, near Beaumont, Tex. Begun Oct. 27, 1900; completed Jan. 10, 1901; time 75 days.

From	To.	Made Feet.	Formation.
0	36	36	Yellow clay.
36	56	20	Coarse gray sand.
56	170	114	Blue clay, pretty hard.
170	245	75	Fine gray sand.
245	265	20	Variously colored gravel, from bean to goose egg size.
265	317	52	Coarse gray sand.
317	352	35	Blue clay.
352	376	24	Coarse gray sand with pyrites concretions.
376	395	19	Blue clay.
395	440	45	Fine gray sand with lignite.
440	448	8	Marl.
418	508.75	60	Gray sand with concretion and much lignite.
508	528 25	0.75	Soft limestone.
508.75	528 25	19.50	Gray clay and sulphuretted hydrogen gas.
528.25	529	0.75	Hard sandstone, with calcite depositions.
529	563	34	Gray sand.
563	588	25	Compact hard sand, with pyrites.
588	588.5	0.5	Hard sandstone and calcareous concretions.
588.6	601.75	13.25	Gray clay.
601.9	602	1.25	Hard sand.
602	659	57	Gray clay with calcareous concretions.
659	665	6	White, calcareous shells.
665	679	14	Gray clay.
679	685	6	Gray sandstone with oil.
685	692	7	Gray clay with calcareous secretions.
692	715	23	Gray clay, getting harder.
715	717	2	Calcareous concretions with calcite.
718	833	116	Hard gray clay with calcareous concretion; much fine pyrite.
833	853	20	Hard gray clay with calcareous concretion; much fine pyrites.
853	873	20	Sandstone and pyrites; hard.
873	875	2	Hard rock; apparently limestone.
875	899	24	Fine oil sand, with large layer toward bottom and heavy pressure under it, filling casing for 100 feet above point of drill.
899	979	80	Hard clay.
979	1,029	50	Calcareous concretions, with layers of hard sandstone.
1,029	1,069	40	Struck heavy gas pressure and oil which lasted about 1 hour and then subsided.
1,069	1,139	70	Sand mixed with calcareous concretions and fossils.

Evaporation Test Made with Beaumont Crude Oil at Plant of Houston Electric Street Railway Company, Tuesday, May 7th, 1901.—E. H. McGregor, President Company.

Duration of test	7 A.M. to 7 P.M.
Oil consumed	1,253.14 gallons
Weight of oil per gallon	7.43 pounds
Weight of oil consumed	9,310.83 pounds
Water evaporated	106,640.00 pounds
Water per pound of oil	11.43 pounds
Temperature of feed water	78° F
Steam pressure	140 pounds
Factor of evaporation	1.1866
Evaporation from and at 212°	13.58 pounds

Test made under two B. & W. boilers.

Test made with mine-run Huntington, Ark., coal at the Dallas Electric Company's plant on August 5, under boiler of rated capacity of 370 horse power, based on 10 square feet of heating surface; duration of test eight hours from 8:30 A.M. to 3:30 P.M.

Coal consumed 10,000 pounds.

Cost of coal per ton of 2,000 pounds delivered in plant $3.15.

Water evaporated 75,973 pounds.

Water evaporated per pound of coal 7.59 pounds.

Temperature of feed water 90°.

Evaporated from and at 212 per cent. 8.87 pounds.

Steam pressure 110 pounds.

Factor of evaporation 1.169.

Cost of coal to evaporate 75,973 pounds of water $15.75.

Evaporation test of Beaumont crude oil at the Dallas Electric Company's plant, under boiler of rated capacity of 370-horse power, based on 10 square feet heating surface, using one burner, duration of test eight hours, from 10:25 A.M. to 6:25 P.M. August 17th.

Oil consumed 6,447.5 pounds.

Weight of oil per gallon 7.43.

Water evaporated 75,985 pounds.

Water evaporated per pound of oil 11.78.

Temperature of feed water 90°.

Steam pressure 110 pounds.

Factor of evaporation 1.169.

Evaporated from and at 212 per cent., 13.77.

Cost of oil to evaporate 75,985 pounds of water at 59 cents per barrel of 42 gallons, $12.19.

The tests were made under the supervision of A. K. Bonta, the engineer who has charge of remodeling the plant of the Dallas Electric Company.

B.T.U. of Various Oils.

	Beaumont	Penn. and Ohio	Baku, Russia
By Redwood	19,388	.....	.....
By Prof. Denton	19,060	20,200	19,500

Comparative Test of Beaumont Oil and Coal as Fuel on the Southern Pacific Railroad.

Specific gravity of oil used, .9594 (16° B); flashpoint, 240° F; fire test, 290° F.

	Oil	Coal
Miles run	224	224
Average steam pressure	133	130
Gallons water evaporated	6,609	5,980
Oil burned	755	.....
Pounds fuel	6,040	8,043
Miles per ton	74.14	55.72

Amount fuel doing same work 3.1 bbls. (bbl. 42 gal.) 1 ton. From this, with oil at 30 cents per barrel, coal should be 93 cents per ton, or with coal at $3 oil should be 97 cents per barrel.

Jennings Oil Analysis.—Color, reddish brown; specific gravity, .9172-22.6° B.; water, 5.00 per cent. by volume; sulphur, 0.36 per cent. by weight.

Distillation Test.

Fraction No.	Temperature of Distance.	Per Cent. Per Volume.	Per Cent. By Weight.	Special Gravity Direct Baume.		Des. of Fraction.	Resume.
1	200° F.	....	....	....	....	.....	Water.
2	200–250	....	....	....	....	....	Naphthas.
3	210–302	2.2	2.04	.8517	24.5	Light canary	210–302° F.
4	302–350	0.5	.46	.8568	33.4	Colorless	2.2 per cent.
5	350–400	0.7	.65	.8618	32.4	to	Burning oil.
6	400–450	9.7	9.23	.8726	30.4	Light canary	302°–572° F.
7	450–500	14.1	13.60	.8846	28.3		44.7 per cent.
8	500–550	13.9	13.53	.8928	26.8	to	....
9	550–572	5.8	5.73	.9061	24.5	Canary	Paraffine oil.
10	572–600	5.1	5.06	.9102	23.8		572°–760° F.
11	600–650	23.6	22.91	.8903	27.2	to	50.0 per cent.
12	650–700	17.1	16.93	.9802	24.1	Terra cotta	....
13	700–760	4.2	4.59	1.0041	0.6	Dk. bronze green.	Coke
Coke	.....	....	2.38	....	....	.....	By weight 2.38 per cent.
Total	.....	96.9	97.11	....	....	.....	.....

C. C. TUTWILER, Chemist.

(To be Continued.)

Railway Carriage Lighting by Means of Compressed Gas.

[From a paper read by M. NAUDE, Nantes Meeting, French Gas Association.]

At the Congress of the Société Technique held at Nantes in 1881, M Goelzer contributed a paper on the experiments which were then being made with the view of substituting compressed oil gas lighting for the ordinary oil lighting then in use for railway carriages. Two years later, at the Marseilles Congress, M. Cornault described the new oil gas works at the St. Charles station in that city, and threw out the suggestion that there was a new use for coal gas in this direction. The fact that many of the gentlemen attending the present Congress were able to perform the journey to Havre in carriages lighted by gas compressed at the gas works, is a proof of the practicability of the suggestion. The first attempts to light carriages by the incandescent system were made in 1897, but with only indifferent results. In 1901, the matter was taken up by the Eastern Railway Company of France; but, as they employed oil gas in the ordinary service, they did not go on with the trials of coal gas, but adopted compressed oil gas. The results were, however, sufficiently conclusive to merit further consideration. The Eastern Company's trials had scarcely been completed when the Western Company began to experiment with incandescent lighting by compressed oil gas in the outskirts of Paris; and they attributed some of the good results obtained to the use of the Farkas inverted "Bébé" burner. Further trials showed its utility for the lighting of railway carriages.

In the course of the year 1903, the Western Company began to light their carriages with oil gas on the incandescent system. But towards the end of September, the principal engineer of the technical service, M. Chapsal, instructed two of the Inspectors (MM. Bernier and Mondain) to put themselves in communication with M. Gaston Gautier, the engineer of the European Gas Company at Havre, with the view of establishing a coal gas compressing station there. It was arranged that the Gas Company should provide the station in order to allow the Railway Company to make their trials with the town gas on the ordinary working conditions of the Paris-Havre line. An important step was thus taken in favor of coal gas; but not before many objections had been overcome. As the time required for the equipment of the station by the Gas Company was rather long, the Railway Company themselves put up at the Havre Terminus an old vertical balance engine capable of compressing 350 cubic feet of gas per hour to about 17½ pounds; and the first carriages lighted by it commenced running in May last year.

The Gas Company's installation was started in the following August, and it has worked satisfactorily up to the present time. The motive power is supplied by a 7-horse power gas engine; and the compressing plant is of the type usually furnished by the house of Douane. It consists of two cylinders arranged in tandem—the larger one being 6¼ inches and the smaller one 2¾ inches in diameter—with 6-inch stroke. The force actually required to work it is 3 horse power; and the driving shaft makes 200 revolutions per minute. The working capacity of the plant is 900 cubic feet of gas compressed to 50 pounds per hour. The gas is sent into two storage wagons placed on a siding near the ordinary lines by means of iron pipes laid about 2 feet below the surface of the ground, and having a protecting covering of tarred wood. The total length is about 550 yards.

Each carriage is fitted with two cast iron receivers running parallel with the framework. Their capacity varies from 7 to 25 cubic feet, according to the size of the carriage. Those which were formerly used for the compressed oil gas are only charged to 15 pounds pressure; the new ones, however, were especially made to contain coal gas at 33 pounds. The lanterns in use are of two kinds—the "West" (Fig. 1) and the Delamarre. It appears that the latter gives the better results. As a matter of fact, only two changes have been made in the oil gas lanterns; but those to be constructed specially for incandescent lighting will differ materially from the others. For instance, they will be made so as to open from the inside, which will facilitate cleaning. Another improvement which is under trial is the provision of a flashlight, to be brought into use either by the Company's servants, by means of a 3-way cock placed after the regulator, and allowing the gas to go into the supply pipes to the burners and flashlight, to the latter only, or to be shut off entirely; or to be operated from the interior of the compartment by the passenger by means of a handle placed near the lantern, and enabling him to have the full light, to lower it, or to leave only the flashlight. This new arrangement (Fig. 2) has been in use on a coach on the Paris-

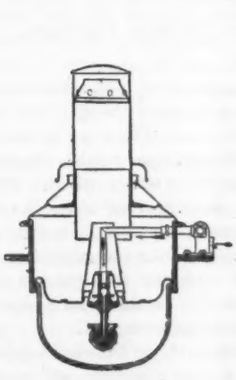


Fig. 1.

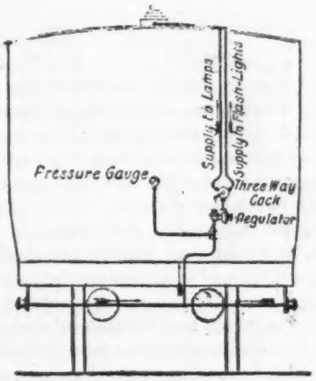


Fig. 2.

Havre line since May. The burners employed are, as already mentioned, the Bébé; and they give an excellently diffused light. Regulated for a consumption of 1.3 to 1.4 cubic feet of coal gas per hour at a pressure of 71-tenths, they produce a light of 32 candles; while with about 0.5 cubic foot of compressed oil gas, at about 48-tenths pressure, it was 30 candles. So that, about 2½ times as much coal gas as oil gas is needed to obtain the same illuminating power. The cost of compression may be reckoned at 7.5c. to 8c. per cubic meter (say, about 41 cents per 1,000 cubic feet), exclusive of the charges for redemption of capital spent on the station. The average life of the mantle is estimated by the railway company at 30 days; but this will be extended when the improved lanterns come into use.

The trials already made have given the Railway Company every satisfaction; and they are now carrying out, under the direction of M. Chapsal, a complete scheme of gas compressing stations, comprising two in Paris (Clichy and Montmartre), and one each at Sotteville, Havre, Caen, Le Mans, and Rennes. The two Paris stations are actually ready for bringing into use. The Clichy station, which will

serve the St. Lazare Terminus, will have two sets of plant, each consisting of 3 Douane compressors, similar in every respect fo those at Havre, but enabling about 1,800 cubic feet of gas to be compressed per hour. When the two Paris stations are in operation, the Railway Company will be able, with the one at Havre, to supply all the coaches running on the Paris suburban lines as well as large numbers of those working on the Paris-Havre line.

The example set by the Western Railway Company has been followed by others. The Compagnie du Midi are about to put on trial 80 coaches supplied with compressed coal gas; and the Orleans Company intend making an experiment with coal gas, which will be supplied ready compressed by the Midi Company. The subject is under consideration by the Paris-Lyons-Mediterranean Company; but they possess installations of rich gas which they will probably utilize. In Italy, Sicily, Spain and Austria, trials of compressed coal gas lighting are about to be made. In England they have already been commenced. Its successful employment for railway carriage lighting justifies the hope that it may in time replace oil gas in a number of its applications, such as for lighthouse illumination, buoys, and even for supplying the motive power on small steamboats.

It will be useful to give, in conclusion, some of the results of the Havre experiments in compressing coal gas. The operation gave rise to condensation of two liquids—water and benzol—which are separated in the vessel placed to receive them. At about 45 pounds pressure, the proportion collected per 100 cubic meters (say 3,500 cubic feet) of gas was 0.54 liter of water and 2.35 liters of benzol. Fractional distillation of the benzol gave on an average: From 50° to 80°, 4 per cent.; from 80° to 100°, 75 per cent.; and above this, 21 per cent.—that is to say, 75 per cent. of benzine and 21 per cent. of toluene. The effect of this condensation is a lowering of the illuminating and calorific power of the gas, and a a diminution of its utilizable volume. Experiments undertaken with the view of determining the importance of these effects of compression were not sufficiently advanced to allow the author to give his colleagues any results. At the same time he stated that practice had shown that this reduction of lighting and heating power in the gas had little effect upon the luminosity of the mantle. As mentioned in his paper, the inverted burners used by the Western Railway Company give, at a pressure of 71-tenths, the light of 1 carcel (9.6 candles) under excellent conditions of consumption.

Atmospheric Condensation Causes Damage.

Iron Age notes that considerable loss to machine tool manufacturers of New England recently resulted from a curious though not unprecedented coincidence of atmospheric conditions. The weather had been cold, so cold in fact that workmen experienced considerable discomfort in the shops, and at the same time the humidity was unusual. Within the few hours from 11 A.M to 2 P.M. the mercury rose more than 40°. Heavy pieces of metal then began to sweat, not slightly but in great drops, as if rain were falling upon them. Thinner pieces of metal experienced little of this, because they soon took the temperature of the atmosphere. Heavier pieces, warming slowly, presented an appearance the like of which few foremen or workmen had ever seen.

At first the danger of the ruin of finished surfaces from oxidation was not realized. In one large shop, however, the manager, who chanced to be in the works, impressed the menace upon the minds of his employees. The moisture, with which the air was heavily laden, condensed with extreme rapidity, so that from a large surface the drops were scraped by the hand, to fall with a splash upon the floor, only to be replaced almost instantly by as watery a condition. Parts of machines in process of manufacture and parts of the machines of the shop equipment were in imminent danger of serious rusting. The shop force went to work with much vigor. The only method that succeeded was to wipe away the moisture and instantly apply a coat of slush. This was done as far as possible, but many finished surfaces were damaged, either by a complete layer of the rust or by spots. Consequently considerable expense was entailed in refinishing such surfaces. The trouble was by no means confined to this one shop. Many machine builders suffered, some more seriously than others, because no one woke to the emergency. Fortunately, such a circumstance is rare, for it is seldom that so extreme a change in temperature is experienced, especially when coupled with a humid atmosphere. Happily, also, smaller parts and shell-like pieces like hollow cylinders do not snffer because they quickly take the atmospheric temperature and there can be no condensation. To illustrate this, one large cylinder, perhaps 18 inches in diameter and ¾ inch thick, was not touched by rust, while large solid cylinders a few feet from it were seriously affected. If a portable steam blast were at hand or artificial heat given the exposed metal by some other means it would not suffer, of course, but in the machine shop such apparatus would be seldom available.

In the winter, where a shop is kept heated at a somewhat constant temperature—at any rate, at a temperature within the limits so that there can be no extreme variation of temperature within a few hours—humidity may be disregarded. The only remedy when the condition does exist, as it must at times in a climate where extremes of weather are frequent, is to act quickly and intelligently, remembering that exposed finished surfaces must be given a moisture proof covering. Perhaps it would be well to prepare for such an emergency as soon as a cold, damp spell of summer weather makes its appearance by a generous use of slush. Of course, there is always the danger of comparatively trifling losses occasioned by an extreme dampness of weather, especially on the seaboard, where fogs are prevalent. But it would take not a few such occasions combined to equal the serious effects of the instance here noted.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

GENERAL JAMES A. GARY has resigned from the Board of Directors of the Consolidated Gas Company, of Baltimore, Md.

MR. GEORGE O. MORRISON, formerly General Agent of the Toledo (O.) Railway and Terminal Company, has been appointed Manager of the new business department of the Toledo Gas Light and Coke Company.

AT a meeting of the Directors of the Stamford (Conn) Gas and Electric Company the following action was taken respecting the memory of the late Mr. James Irving Raymond:

"James Irving Raymond, one of the Directors of the Stamford Gas and Electric Company, died April 19th, 1905. Coming to Stamford after a successful business career in New York, it would have been but natural if he had sought in his country home that freedom from care and quiet enjoyment which he had so well earned. But he quickly became one of the leading citizens of Stamford, among the foremost in seeking to promote its interests, and in contributing to its growth and general prosperity. In the church, of which he was trustee; in the local government, in which he was an official; in this Company, of which he was a faithful Director, and in this community, to which he gave so much of his time and means, he will be greatly missed.

"We hereby adopt this minute as an expression of our sorrow at his death, in the midst of his usefulness, and direct that it be entered upon our records, and that a copy be sent to Mrs. Raymond, with the sincere sympathy of the members of this Board, his associates and friends."

AFTER much discussion the Directors of the Columbus (O.) Gas Light and Heating Company have decided to keep the artificial gas making plant in action for the ensuing year.

THE Directors of the Evansville (Ind.) Gas and Electric Light Company have issued the following notice to their consumers: "The Directors of the Evansville Gas and Electric Light Company, realizing the continued growth of Evansville and the necessity for a change in the manner of paying bills, from the payment to collectors to the payment at the office of the Company, as is done in all the cities of the country, have resolved to reduce the price of gas to 97 cents per 1,000 cubic feet to all consumers who pay their bills at the office or any of the agencies designated on the back of bill on or before the 12th day of the month. Gas will be billed at $1.10 per 1,000 cubic feet, and all who pay before the 12th of the month will be allowed a discount of 13 cents per 1,000 cubic feet. Bills not paid on or before the 20th day of the month will be subject to turn off without further notice. On and after July 1, 1905, a minimum bill of 50 cents will be charged on all meters where the consumption of gas does not equal that amount."

MR. GODFREY L. CABOT, writing from Boston, Mass., under date of the 11th inst. says: I have read with very great interest the very well thought out paper of Irvin Butterworth in your issue of the 10th inst., and heartily concur with him in his views as to the condensation of water from gas lines. The expense is a minute fraction of what it is by the other methods proposed. Practically there is no need of any special apparatus to heat such an air condenser, because in every part of these

United States there come times, in the depth of winter, when the thermometer rises above the freezing point, and that melts the frost in such water catches as are exposed to the open air, and which can then be run out without the loss of any gas, and without any more complicated apparatus than a pet cock, or a 1-inch globe valve mounted on a close nipple and screwed into the bottom of the water catch. My experience is that under these conditions the globe valve will not be broken by the frost, nor will the close nipple on which it is mounted, although of course if a long nipple be used it will be broken. If these water catches are sufficiently large it would be possible, perhaps not to empty them at all, but to allow the gas to drink up in summer the moisture it had deposited in winter, thus diminishing the difficulty of the desiccation of the meters instead of increasing it. Yard meters are not liable to desiccation by this form of a water condenser, because the cold which removes the water from the gas will also prevent desiccation of the meter, unless it be artificially heated to a considerable extent. The main points to be observed in the construction of such a water catch are: First, sufficient surface to produce the requisite cooling effect on a maximum output of gas. Second, a sufficiently large cross section of the pipes through which the gas is passing, so that the flow of gas will not be fast enough to whisk along drops of water with it. Third, this system of pipes should be laid horizontal, as this gives such drops of water, even if very small, an opportunity to fall out of the stream of gas, as the force of gravity acts at right angles to the direction at which the gas is passing and carrying the drops of water.

ABOUT this time the Birmingham (Ala.) Railway, Light and Power Company will have constructed the foundations for the 750,000 cubic foot holder with steel tank to be erected by the Western Gas Construction Company, of Fort Wayne, Ind. The contractors will put a large force of men on the construction work so that the same will be completed in October. The Fort Wayne folks have a large number of holder contracts in the course of construction and erection which necessitated a considerable increase in the working force of this department, although the work is being carried on day and night.

THE municipal government has assumed control of the plant and business of the Caracas Gas and Electric Company, of Caracas, Venzuela.

THE new gas plant constructed by the Manitoba Construction Company for the Winnipeg (Manitoba) Street Railway and Light Company at a cost of $140,000, is in satisfactory operation.

THE Sioux City (Ia.) Gas and Electric Company has purchased the entire block immediately south of its present plant, on which plot it is proposed to construct in due time a storage holder up to retaining 1,000,000 cubic feet.

AT the annual meeting of the Burlington (Vt.) Gas Light Company, the Directors elected were: Morris W. Stroud, S. B. Curtis, Walter Godley, W. P. Murphy and F. H. Parker.

MR. WM. E. MAHER, at one time in the service of the United Gas Improvement Company, as Master Mechanic, has been appointed by Mayor Weaver Chief of the Bureau of Highways, vice Mr. W. H. Brooks, resigned.

MR. NORTHROP MOORE has resigned the dual position of Manager and Superintendent of the Wyandotte Gas Company, of Kansas City, Kas., in order to assume the duties of Assistant Secretary of the Company. Mr. W. H. McKenzie succeeds Mr. Moore as Superintendent.

THE proprietors of the Lebanon (Pa.) Gas Company have declared a semi-annual dividend of 4 per cent., payable on demand.

THE following comes to us by way of Denver, Col., under date of the 6th inst.: "The management of the Colorado Springs (Col.) Gas Company and of the Colorado Springs Light and Power Company will hereafter be in the hands of Mr. George B. Tripp, who assumed the management of the latter Company yesterday morning, at the same time retaining his positon as General Manager of the Electric Company. That this is the first step towards the consolidation of the electric light and gas companies is denied by Mr. Tripp and by directors of both companies. Large interests in both companies are held by the same parties, and it was deemed a matter of economy to place the management of both under the efficient direction of Mr. Tripp. According to Mr. Tripp, neither Company will lose its identity. Separate offices will be maintained as at present. There will be no consolidation, and the board of directors of each company will remain unchanged. Mr. Tripp has been general manager of the electric company for 4 years, succeeding Henry Hine, who resigned to devote his time to the Guanajuato Power and Electric Company in Old Mexico. As manager of the gas company he succeeds Mr. Ira Miller, who will continue in the position of superintendent of the gas company. Mr. Tripp contemplates no changes at present."

THE Louisville *Courier-Journal*, of the 7th inst., had this to say respecting the then status of the proposition to sell two-thirds of the city's holdings in the Louisville Gas Company, the proceeds to be expended in "a good cause:" "The ordinance authorizing the sale by the Mayor of 6,000 shares of stock in the Louisville Gas Company was introduced last night in the General Council, but no action was taken. The ordinance was referred to a committee which will consider all the objections that may be offered before reporting it back to the General Council for passage. There is said to be some opposition in both Boards of the General Council and there may be a sharp fight before the ordinance is finally passed. The ordinance, as offered last night, was prepared by the City Attorney and provides that the Mayor shall advertise for 2 weeks beforehand in all the papers for sealed proposals for the purchase of the whole 6,000 shares or any part thereof. No date has been fixed for the receiving of the bids, this to be left to the Mayor, but under the ordinance the proposals must be opened in the Council Chamber publicly. The city reserves the right to reject any and all bids. The route of the southern outfall sewer is designated accurately and the ordinance carries with it authority not only to sell the gas stock, but also for the Board of Public Works to construct the sewer."

ANNOUNCEMENT is made that the first department of the Carnegie technical schools at Pittsburgh, Pa., will open next October. The department will be known as the School of Applied Science, and there will be day and night courses, providing instruction in those studies essential to a technical education. Applicants for admission to the school must be at least 16 years old. They will be required to pass an examination in English, mathematics, science and drawing. Certificates from approved schools of high school or preparatory grade will be accepted from students without an entrance examination, but no student will be admitted who does not give evidence of a natural aptitude for technical work. Residents of Pittsburgh will be required to pay a tuition fee of $20 a year and all other students $30 a year. The examinations for entrance will be held in Pittsburgh during the week of October 9. Applications have already been received from 7,200 persons throughout the world who are desirous of enrolling themselves as pupils at the institute. Every country in the civilized world is represented by those after learning, and most of them are men who have already reached their majorities and who desire to come to America and learn American methods of doing business. The number of applications from France and Germany exceeds those of any other country, while there is a goodly showing from Japan and Russia and a few from China. The Philippines have sent in many applications. On account of the enormous number of applications it has been decided to receive pupils from Pittsburgh and Allegheny first, then the State of Pennsylvania and the other States of the Union, leaving the foreign countries until the last.

AT the annual meeting of the Milwaukee Gas Light Company the officers elected were: President, Emerson McMillin; Vice-President and General Manager, E. G. Pratt; Second Vice-President, S. M. Green; Secretary and Treasurer, E. Haase; Chairman Board of Directors, Jno. P. Murphy.

ADVICES by way of Goderich, Ont., dated July 8th, are to the effect that the Hon. J. W. St. John, Peter Ryan, of Toronto, W. L. Horton, of Goderich, and Jno. J. Drynan and J. J. Walsh, of Toronto, have applied to the Goderich Council for a franchise, to run for 30 years, under which they propose to operate the Goderich Heat, Light and Power Company, for the sale in the place named of gas for any and all uses to which it is applicable. The concern is capitalized in $75,000.

HARRISBURG (PA.) capitalists have given notice that they propose to apply to the Governor of Pennsylvania for a charter to operate the Camp Hill Illuminating Company, for the purpose of supplying light and power to the residents of Camp Hill.

The Market for Gas Securities.

There is nothing to chronicle respecting the market for city gas shares, albeit the quotations for Consolidated, as between to-day (Friday) and Friday of last week, show a gain in the bid price of a point. The State Lighting Commission is still in abeyance, although many are waiting to be called.

Brooklyn Union is absolutely lifeless so far as regular trading is concerned, and the quotations are of the most perfunctory sort. Peoples, of Chicago, experienced a sharp drop, but the cause is hard to find. Baltimore Consolidated is at the figures of a week ago. General Gary has resigned from the Company's Board of Directors, and its annual meeting will be held the 17th inst.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.

16 Wall Street, New York City.

July 17.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share.

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked.*
Consolidated	$73,177,000	100	190½	191½
Central Union, Bonds, 5's.	3,000,000	1,000	108½	110
Equitable Bonds, 6's	1,000,000	1,000	..	109
" 1st Con. 5's	2,300,000	1,000	118	120
Mutual	3,500,000	100	300	320
Municipal Bonds	750,000	..	..	..
New Amsterdam Gas Co. ..				
Bonds, 5's	11,000,000	1,000	111	113
New York & Richmond Gas Co. (Staten Island)	1,500,000	100	35	..
1st Mtg. Gold Bds. 5 p. ct.	1,000,000	..	..	..
Northern Union, Bonds, 5's.	1,250,000	1,000	104	106
New York and East River..				
Bonds 1st 5's	3,500,000	1,000	112	114
" 1st Con. 5's	1,500,000	..	106½	108½
Standard	5,000,000	100	125	130
Preferred	5,000,000	100	145	155
Bonds, 1st Mortgage, 5's	1,500,000	1,000	116	117
Yonkers	299,850	500	130	..
Out-of-Town Companies.				
Brooklyn Union	15,000,000	100	187	194
" " Bonds (5's)	15 000,000	1,000	113	115
Bay State	50,000,000	50	⅛	3/16
" ncome Bonds	2,000,000	1,000	..	75
Binghamton Gas Works	450,000	100	..	65
" 1st Mtg. 5's	509,000	1,000	93	96
Boston United Gas Co.—				
1st Series S. F. Trust	7,000,000	1,000	82	85
2d " " "	3,000,000	1,000	47½	50
Buffalo City Gas Co.	5,500,000	100	6	7
" " Bonds, 5's	5,250,000	1,000	66	68½
Capital, Sacramento	500,000	50	..	35
Bonds (6's)	150,000	1,000	..	..
Chicago Gas Co. Guaranteed Gold Bonds	7,650,000	1,000	104	104½
Cincinnati Gas and Electric Co	29,500,000	100	103¼	103¾
Columbus (O.) Gas Co., 1st Mortgage Bonds	1,500,000	1,000	97½	99
Columbus (O.) Gas Lt. & Heating Co	1,683,750	100	..	95
Preferred	3,026,500	100	107½	103
Consumers, Toronto	,000,000	50	200	204
Consolidated, Baltimore	11,000,000	100	83	..
Mortgage, 6's	3,600,000	..	..	118
Chesapeake, 1st 6's	1,000,000	..	..	..
Equitable, 1st 6's	910,000	..	..	..
Consolidated, 1st 5's	1,490 000	..	..	112
Consolidated Gas Co. of N.J.	1,000,000	100	15	17
" Con. Mtg. 5's	880,000	1,000	89½	92
Bonds	75,000	..	..	100
Detroit City Gas Co	4,825,500	50	..	50
" Prior Lien 5's	5,603,000	1,000	..	98
Detroit Gas Co., 5's	381,000	1,000	75	80
" Inc. 5's	16,000	100	98½	100
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	..	101
Essex and Hudson Gas Co.	6,500,000	..	39	40
For Wayne	2,000,000	..	..	..
" Bonds	2,000,000	..	55	..
Grand Rapids Gas Lt. Co.				
1st Mtg. 5's	1,225,000	1,000	104½	105
Hartford	750,000	25	190	200
Hudson County Gas Co., of New Jersey	10,500,000	..	104½	105¼
" Bonds, 5's	10,500,000	..	107	108
Indianapolis	2,000,000	..	70	75
" Bonds, 5's	2,650,000	..	104½	105
Jackson Gas Co	250,000	50	82	..
" 1st Mtg. 5's	290,000	1,000	101	102½
Kansas City Gas Light Co., of Missouri	5,000,000	100	..	86
Bonds, 1st 5's	3,822,000	1,000	102	104
Laclede, St. Louis	10,000,000	100	..	
Preferred	2,500,000	100	101¾	105
Bonds	10,000,000	1,000	108½	109
Lafayette Gas Co., Ind.	1,000,000	100	..	60
Bonds	1,000,000	1,000	60	65
Louisville	3,570,000	50	143	145
Madison Gas & Elec. Co.				
" 1st Mtg. 6's	350,000	1,000	107½	108½
" 6 per cent. scrip, due 1910	100,000	25	85	87
Montreal, Canada	2,000,000	100	218	218¾
Nashville Gas Lt. Co.	1,000,000	100	110	..
Newark, N. J., Con. Gas Co.	6,000,000	..	56	58
Bonds, 6's	4,600,000	..	105	105¾
New Haven	2,000,000	25	200	..
Peoples G. L. & Coke Co., of Chicago	25,000,000	100	97½	100
Peoples Gas Lt. & Coke Co., Chicago, 1st Mortgage	20,100,000	1,000	..	..
2d "	2,500,000	1,000	104	
Rochester Gas & Elec. Co..	2,150,000	50	88	..
Preferred	2,150,000	50	118	..
Consolidated 5's	2,000,000	..	87½	90
San Francisco, Cal.	15,800,000	100	58½	58¾
St. Joseph Gas Co.				
" 1st Mtg. 5's	751,000	1,000	94	96
St. Paul Gas Light Co.	1,500,000	100	45	47
1st Mortgage 6's	650,000	1,000	113	116
Extension, 6's	600,000	1,000	112½	115
General Mortgage, 5's	2,485,000	1,000	92	93
Syracuse, N. Y.	1,975,000	100	50	55
Bonds	2,047.000	1,000	102	..

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Position Wanted.

Young woman desires position with progressive gas company. Will show ranges in salesroom, inspect and give instruction in homes and do demonstration work, as desired. Moderate salary accepted, where there is opportunity to advance. For references and other particulars, address,

MISS HARRIET RINAKER,
1571-1 CARLINVILLE, ILLS.

NOTICE.

The city of Fort Wayne, Ind., through its Board of Public Works, will receive proposals for the construction and installation of a Gas Plant within the corporate limits of said city of Fort Wayne, for the purpose of manufacturing and distributing gas to the inhabitants thereof, for fuel and illuminating purposes. The term of contract upon which proposals will be received is 25 years.

Detailed specifications can be obtained by applying to Board of Public Works of the city of Fort Wayne, Ind. All proposals to be submitted by twelve (12) o'clock noon of Aug. 24, 1905. Each proposal must be accompanied with a certified check for five thousand dollars ($5,000), conditioned that he, they or it will enter into contract if proposition submitted is accepted. 1571-2

NOTICE!

PLEASE read the advertisement of the Empire Gas Improvement and Construction Company, on page 101 This Company employs only high-priced and quick-working mechanics, and all its work is guaranteed to be strictly first class, and will be finished at time specified. A. M. SUTHERLAND,
1545-eot. tf 49 Wall Street.

Position Wanted

AS MANAGER of a GAS COMPANY,

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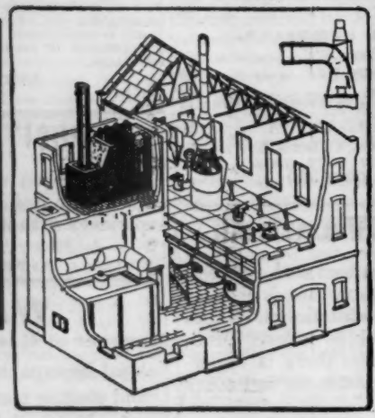

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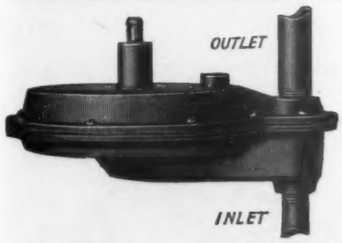

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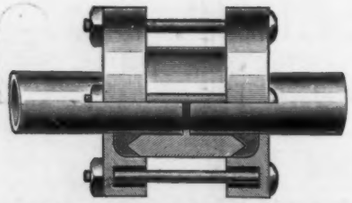

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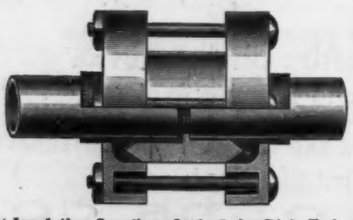

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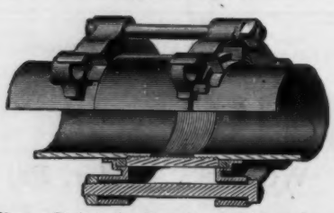
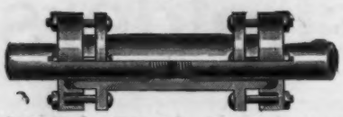


Clamp, Style 4, for Repairing Leaks on Screw Collar.



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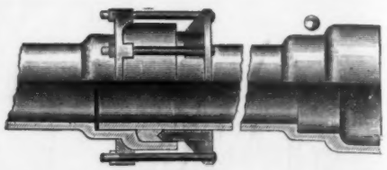

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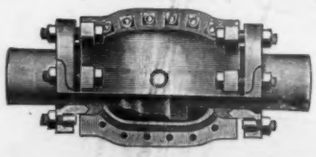

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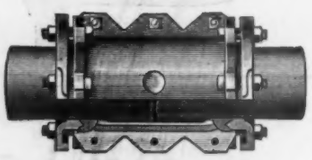

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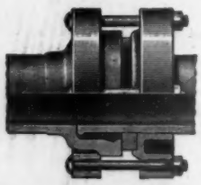

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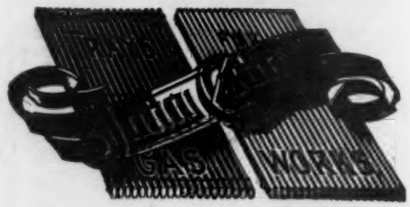

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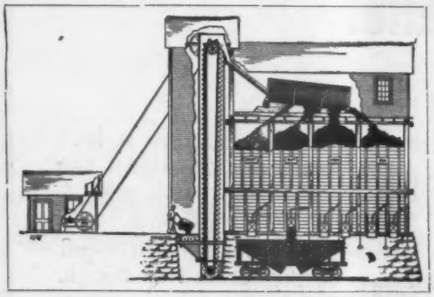

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ENTIRE GAS WORKS,

or any separate portion of the same, such as **Gasholders, Coal Gas Benches, Lowe-Sutherland** double-superheater **Water Gas Sets,** Scrubbers, Condensers, Exhausters, Purifying Boxes, Street Governors, Street Mains and Main Laying.

The high character of the work done by A. M. Sutherland during the past 15 years will be strictly adhered to and all work is warranted.

Mr. Sutherland remains with the Company for two years President and Director, and will give personal attention to contracts.

EMPIRE GAS IMPROVEMENT AND CONSTRUCTION CO., 49 Wall St., New York.

IMMERSION WASHERS.

A design embodying particularly desirable features.

LLOYD CONSTRUCTION COMPANY,

Western Sales Agents for
BARTLETT, HAYWARD & CO., Baltimore, Md.

DETROIT, MICH.

MUELLER PIPE REAMERS.

RATCHET HANDLE PATTERN.

C-035.

When you use several different sizes of pipe reamers it isn't always convenient to find among your numerous tools just the size you want for a particular pipe.

The Mueller Pipe Reamer is so designed in length and taper that one tool has capacity for all sizes of pipe from ⅛ to 3-inch. You are never at any inconvenience in finding the size you want.

Mueller Pipe Reamers have the blades relieved and are made in plain handle and ratchet handle patterns. The reamer illustrated is the ratchet handle pattern.

Each reamer is carefully inspected and assembled, is given an actual working test, bears the Mueller trade mark, and is *unconditionally guaranteed.*

We also make tapping machines, meter connections and gas cocks for gas works' use. Catalogues upon application.

EASTERN DIVISION—Located at 254-258 Canal Street (cor. Elm), New York City, carries a full stock of Mueller goods.

THREE GRAND PRIZES were awarded Mueller Water, Gas and Plumbing goods, respectively, at St. Louis.

H. MUELLER MFG. CO.,

DECATUR, ILL., U. S. A. **NEW YORK, N. Y., U. S. A.**

ROOTS' GAS EXHAUSTERS.

Installation showing our latest improved machines, with flexible rope coupling, for large units.

SEND FOR CATALOGUE.

HOME OFFICE:
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GOLD MEDAL AT ST. LOUIS, 1904.

ARTHUR E. BOARDMAN, C.E.,

For several years associated with the late
CAPTAIN WILLIAM HENRY WHITE,
WILL CONTINUE THE BUSINESS OF
CONSULTING ENGINEER
For Gas, Water and Electric Light Companies, at
No. 41 Wall Street, Room 1707, New York.
TELEPHONE, 5534 BROAD.

FRANK D. MOSES,

Telephone, 204-A TRENTON, N. J., Telephone, 204-A

Constructing Engineer and Contractor.

Estimates Furnished on any kind of Work in Connection with Gas or Water Plants.
SPECIAL ATTENTION GIVEN TO THE REMODELLING AND EXTENDING OF THE PROPERTIES OF WORKS NOT UP-TO-DATE.
CORRESPONDENCE SOLICITED.

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JOHN DONALDSON, Prest., Betz Bldg., Phila., Pa.

EMAUS PIPE FOUNDRY.

DONALDSON IRON COMPANY. EMAUS, PA.

MANUFACTURERS OF

CAST IRON PIPE AND SPECIAL CASTINGS

FOR WATER AND GAS.

Also, FLANGE PIPE, LAMP POSTS, Etc.

GAS TAPPING MACHINES

—FOR—

Drilling and Tapping Pipe under Pressure

WITHOUT ANY ESCAPE OF GAS.

They are Strong and Compact.

Size of Combination Drills and Taps ¾ to 4-inch.

Machines Sent to any Gas Company for Thirty Days' Trial.

Send for Circulars.

Geo. Light,
DAYTON, O.

MUELLER GAS MAIN TAPPING MACHINE.

C—1004.

The Mueller "Swivel No. 1," "Swivel No. 2" and "Swivel No. 3" Tapping Machines are made especially for tapping gas mains under pressure. They are made extra heavy in all parts, have extra long ratchet sweep and can be adjusted to any angle or corner of the ditch. The No. 1 taps up to 2-inch, the No. 2 up to 3-inch and the No. 3 up to 4-inch. The "Century Junior" makes taps from ¼ to ¼ inch in high pressure mains. Unconditionally guaranteed. Catalogues upon application.

H. MUELLER MFG. CO.,
Decatur, Ill., U. S. A. New York, N. Y., U. S. A.

"THE MINER"
Globe Street and Boulevard Lamps.
Cheapest and Best
THOUSANDS IN USE WITH INCANDESCENT BURNERS.
Send for Catalogues.
THOMAS T. W. MINER,
821-823 Eagle Av., N.Y.

GASHOLDER TANKS AND GAS WORKS MASONRY COMPLETE.

Plans prepared and Estimates furnished at short notice.

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938 Java Street, Brooklyn, N. Y.

WARREN FOUNDRY AND MACHINE CO.,

Established 1856. Works at Phillipsburgh, N. J.

New York Office, 160 Broadway.

CAST IRON WATER AND GAS PIPE,

FROM THREE TO FORTY-EIGHT INCHES DIAMETER. ALSO, ALL SIZES OF

Flange Pipe for Sugar House and Mine Work. Branches, Bends, Retorts, etc., etc.

CHARLES MILLAR & SON CO., Selling Agents, Utica, N.Y.

Flanged Pipe and Fittings, Hydrants, Bends, Pig Lead, etc. etc.

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Manufacturers of Lead Pipe, Solder, etc., and Jobbers of Plumbers' and Tinners' Goods.

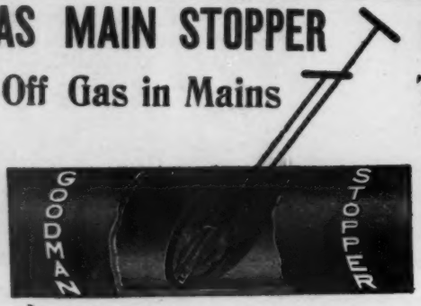
CAST IRON PIPE and SPECIALS FOR WATER AND GAS.

Wholesale Eastern Agents AKRON VITRIFIED SEWER PIPE.

SAFETY GAS MAIN STOPPER COMPANY,

For Shutting Off Gas in Mains

Any size gas main can be shut off in 30 seconds. : : :



Temporarily during alterations and repairs. : : : :

STOPPERS SENT ON TRIAL.

Address: SAFETY GAS MAIN STOPPER CO., 1668 Park Ave., New York City.

This is No. 2.

Height, 36 inches.
Diameter, 12 "
Shipping weight, 80 lbs.
Net weight, 50 lbs.
The products of combustion are entirely separate from the water. Entire water surfaces are tinned.

Price, $35.00.

HOT WATER

FOR BATHROOM AND KITCHEN

is most easily, quickly and economically supplied by a

Humphrey Crescent Instantaneous Water Heater.

Prices range from $20 to $45.
Every Heater GUARANTEED.

Set a heater for every gas consumer. You will please them and increase sale of gas at the same time.

Send to-day for catalogue and discounts to

HUMPHREY CO.,
Kalamazoo, Mich.,

The only manufacturers in the World of a COMPLETE LINE OF INSTANTANEOUS WATER HEATERS.

GEORGE R. ROWLAND,
Formerly with the Continental Iron Works.
Draughtsman and Constructing Engineer.
Drawings, Specifications and Estimates furnished for the construction of new works or alteration of old works. Special attention given to Patent Office drawings.
Office, No. 245 Broadway, N. Y. City.

J. F. W. JOST,
CHEMICAL ENGINEER
—IN—
GAS MANUFACTURE,
P. O. BOX 2043, PHILADELPHIA, PA.

AMERICAN METER CO.,

NEW YORK, ST. LOUIS, PHILADELPHIA, SAN FRANCISCO, CHICAGO,

Photometrical and Experimental Apparatus.

PUBLIC LIGHTING TABLE.

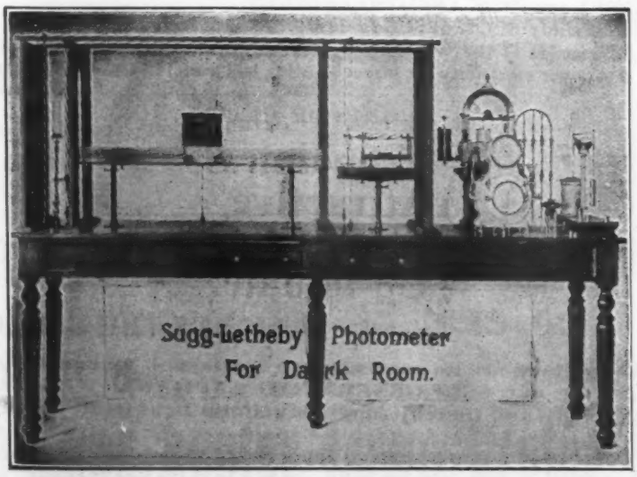
AUGUST, 1905.

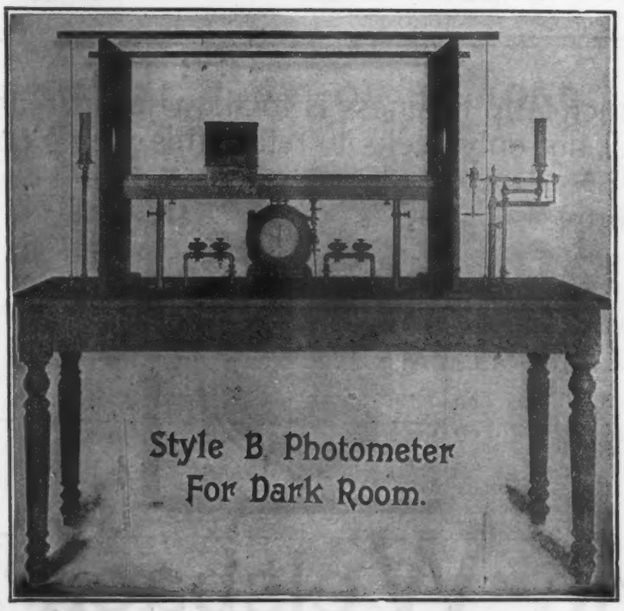
Day of Week.	Date.	Table No. 1. FOLLOWING THE MOON. Light.	Extinguish.
Tue.	1	7.40 PM	4.00 AM
Wed.	2	7.40	4.00
Thu.	3	7.40	4.00
Fri.	4	7.40	4.00
Sat.	5	9.10	4.00
Sun.	6	9.40	4.10
Mon.	7	10.20 FQ	4.10
Tue.	8	11.00	4.10
Wed.	9	11.50	4.10
Thu.	10	12.40 AM	4.10
Fri.	11	1.30	4.10
Sat.	12	2.30	4.10
Sun.	13	No L.	No L.
Mon.	14	No L. FM	No L.
Tue.	15	No L.	No L.
Wed.	16	7.30 PM	8.50 PM
Thu.	17	7.30	9.20
Fri.	18	7.30	9.50
Sat.	19	7.30	10.20
Sun.	20	7.20	10.50
Mon.	21	7.20	11.20
Tue.	22	7.20 LQ	12.00
Wed.	23	7.20	12.30 AM
Thu.	24	7.20	1.20
Fri.	25	7.20	2.10
Sat.	26	7.20	3.00
Sun.	27	7.10	4.20
Mon.	28	7.10	4.20
Tue.	29	7.10	4.20
Wed.	30	7.10 NM	4.20
Thu.	31	7.10	4.20

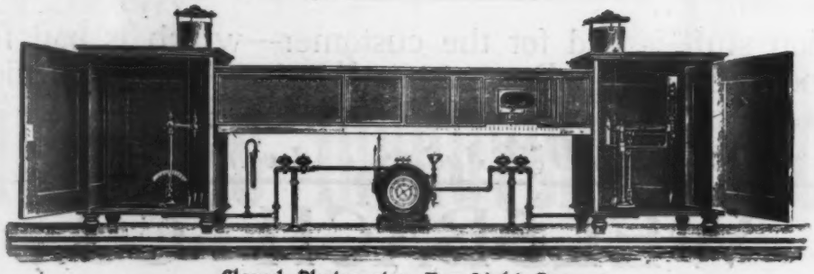
TOTAL HOURS DURING 1905.

By Table No. 1.

	Hrs.Min.
January	240.50
February	192.20
March	207.00
April	175.10
May	161.00
June	139.50
July	149.00
August	161.50
September	173.00
October	205.00
November	211.00
December	229.00
Total, yr.	2245.00







Closed Photometer For Light Room.

CIRCULARS SENT ON REQUEST.

PUBLIC LIGHTING TABLE.

AUGUST, 1905.

Day of Week.	Date.	Table No. 2. NEW YORK CITY. All Night Lighting. Light	Extinguish.
		P.M.	A.M.
Tue.	1	7.10	3.30
Wed.	2	7.10	3.30
Thu.	3	7.10	3.30
Fri.	4	7.10	3.30
Sat.	5	7.10	3.30
Sun.	6	7.10	3.45
Mon.	7	7.10	3.45
Tue.	8	7.10	3.45
Wed.	9	7.10	3.45
Thu.	10	7.10	3.45
Fri.	11	7.10	3.45
Sat.	12	7.10	3.45
Sun.	13	6.55	4.00
Mon.	14	6.55	4.00
Tue.	15	6.55	4.00
Wed.	16	6.55	4.00
Thu.	17	6.55	4.00
Fri.	18	6.55	4.00
Sat.	19	6.55	4.00
Sun.	20	6.45	4.10
Mon.	21	6.45	4.10
Tue.	22	6.45	4.10
Wed.	23	6.45	4.10
Thu.	24	6.45	4.10
Fri.	25	6.45	4.10
Sat.	26	6.45	4.10
Sun.	27	6.30	4.20
Mon.	28	6.30	4.20
Tue.	29	6.30	4.20
Wed.	30	6.30	4.20
Thu.	31	6.30	4.20

TOTAL HOURS DURING 1905.

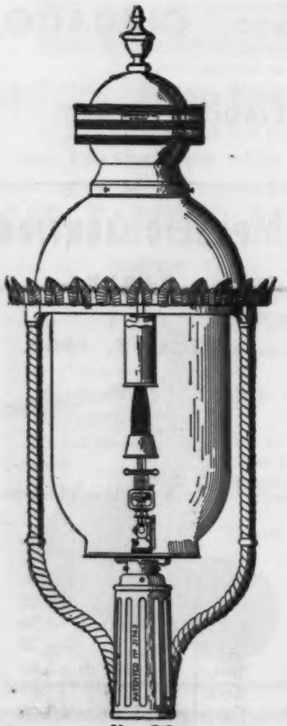
By Table No. 2.

	Hrs.Min.
January	423.20
February	355.25
March	355.35
April	298.50
May	264.50
June	234.25
July	243.45
August	280.25
September	321.15
October	374.30
November	401.40
December	433.45
Total, yr.	3987.45

NEW YORK, 57 Liberty Street. BOSTON, 814 Beacon Building. PHILADELPHIA, Broad and Arch Streets. ST. LOUIS, 712 Roe Building. CHICAGO, Foot of Orleans Street. SAN FRANCISCO, 712 Polk Street.

WELSBACH STREET LIGHTING COMPANY

.... OF AMERICA ....



No. 36.

Controls and Operates the

Welsbach System of Street Lighting,

Which includes its specially DESIGNED AND PATENTED BURNER for STREET and PARK LIGHTING exclusively.

Uniformly SUCCESSFUL in 150 Cities and Towns.

By means of the Welsbach System of street lighting the superiority of GAS over electricity for street lighting has been fully demonstrated.

POINTS OF MERIT:

It is { Economical, Attractive, Successful, Up-to-date.

IT LIGHTS THE STREET.

Where there are no gas mains we can furnish an equally good light by our SELF-GENERATING NAPHTHA WELSBACH BURNER, and thereby supply a uniform light in all localities.

Correspondence Solicited from Gas Companies and Others interested in Municipal and Outside Lighting.

No. 38.

AN underlying principle in business is to show an increase each year---to grow. The astute dealer not only seeks to retain this year's customers, but to attract new trade next year.

The formula is simple---

THIS SHIELD IS THE WELSBACH TRADE MARK.

IT IS A GUARANTEE AND A PROTECTION.

Sell The Welsbach Brands.

The imitation stuff is bad for the customer---which is bad for you.

The genuine Welsbachs---Burners or Mantles---make satisfied customers---keep customers---MAKE NEW ONES.

And your profit isn't merely dollars and cents.

WELSBACH CO.,

Broad and Arch Sts., PHILADELPHIA.

THE UNITED GAS IMPROVEMENT COMPANY

For the Year Ending December 31st, 1904, has been Awarded Contracts for 45 Sets of

Standard Double-Superheater Lowe Water Gas Apparatus.

PARTIAL LIST OF PLACES:

Harrisburg, Pa.
Pelham, N. Y.
Reading, Pa.
Augusta, Me.
Bangor, Pa.
Woonsocket, R. I. (2d contract).
Brooklyn, N. Y. (4th contract).
Cincinnati, O. (2d contract).
Scranton, Pa. (3d contract).
New York City (14th contract).
New Haven, Conn. (2d contract).
Watertown, N. Y.
Tampa, Fla. (3d contract).
Westchester, N. Y. (3d contract).
Bridgeport, Conn. (2d contract.)
St. Paul, Minn. (2d contract).
Springfield, Mass. (2d contract).
Lynn, Mass. (5th contract).
Rochester, N. Y.
Battle Creek, Mich.
Mechanicsburg, Pa.
Excelsior Springs, Mo.
Bristol, Conn.
Jersey Shore, Pa.
Vicksburg, Miss.

TOTAL SETS, 1904, ... 45
TOTAL DAILY CAPACITY, 1904, ... 56,325,000 cubic feet.
TOTAL SETS TO DATE, ... 553
TOTAL DAILY CAPACITY, ... 419,180,000 cubic feet.

The United Gas Improvement Company,

Broad and Arch Streets, Philadelphia.

PARKER-RUSSELL MINING AND MFG. CO.,

OF ST. LOUIS, MO.,

PROPRIETORS OF THE

OAK HILL GAS RETORT AND FIREBRICK WORKS.

ST. LOUIS OFFICE: 417 Pine Street. NEW YORK OFFICE: Aldrich Court, 45 Broadway.

WE MAKE A SPECIALTY OF WATER GAS LININGS AND CHECKER BRICK.

Half and Full Depth Benches of Our Own Design, Containing 6, 8 or 9 Retorts.

SLOPERS.—We have perfected plans of INCLINED RETORT BENCHES, designed to meet conditions prevailing in America, and constructed entirely of American materials.

We Build Benches Complete. Ready for Gas Making. Also,

RETORT HOUSES,

COAL and COKE CONVEYING MACHINERY.

Plans, Specifications and Estimates Cheerfully Furnished.

CORRESPONDENCE SOLICITED.

ALL CONTRACTS MADE AS OF ST. LOUIS, MO.

Gold Medals awarded by the Louisiana Purchase Exposition at St. Loui., for fireclay gas retorts, gas retort benches, firebrick and setting tiles.

ISAAC C. BAXTER, President. ESTABLISHED 1864. PETER YOUNG, Secretary and Treas.

Works, LOCKPORT STATION, PA.

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Successor to WILLIAM GARDNER & SON.

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Fire Clay Goods for Gas Works.

HENRY MAURER & SON,

(ESTABLISHED 1856.)

EXCELSIOR FIRE BRICK & CLAY

RETORT WORKS

WORKS, Perth Amboy, N. J.

OFFICE, 418 to 422 East 23d St., N. Y.

Clay Gas Retorts,

BENCH SETTINGS,

Fire Brick, Tiles, Etc.

GEROULD'S IMPROVED RETORT CEMENT

A Cement of great value for patching retorts, putting on mouthpieces, making up all bench-work joints, lining blast furnaces and cupolas. This cement is mixed ready for use. Economic and thorough in its work. Fully warranted to stick.

Price List, f.o.b. BLOOMINGTON, INDIANA.

In Casks, 400 to 800 pounds, at 5 cents per pound.
In Kegs, 100 to 200 " " 6 " "
In Kegs less than 100 " " 7 " "

C. L. GEROULD, BLOOMINGTON, IND.

For orders East of Buffalo, N. Y., or Pittsburg, Pa., freight will be paid to these points.

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WORKS:
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THEO. J. SMITH, Prest. J. A. TAYLOR, Sec
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MANUFACTORY AT

LOCUST POINT, BALTIMORE, MD.

Clay Retorts, Blocks & Tiles

FIRE BRICK, FIRE CLAY, AND FIRE CEMENT.

Our Improved Half and Full Depth Benches have been Adopted by Many Gas Companies.

WALDO BROS., 102 MILK ST., BOSTON, MASS.

Sole Agents for New England States.

JOHN DELL, *President and General Manager.*

MISSOURI FIRE BRICK CO.,

ESTABLISHED 1882.

MANUFACTURERS OF

Gas Retorts, Bench Settings, Fire Brick, Cupola Linings, Etc.

We are the **Exclusive Agents** *for the* **Mitchell Patent Benches,** *Constructed with Half or Full Depth Furnaces, to Burn either Coal or Coke, and Arranged for Front or* **Rear Clinkering.** **The Mitchell** *is the* **Original Coal Firing Bench.** *We also Erect Plain Benches with* **One** *to* **Six Retorts.**

YOUR CORRESPONDENCE IS RESPECTFULLY SOLICITED.

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By GEORGE LUNGE, PH.D. Third and Enlarged Edition.

Price, $15. For Sale by

A. M. CALLENDER & CO., 42 Pine St., New York City.

Bronder Patent Stoking Machinery.

Three-Scoop and Three-Rake Charging and Discharging Machines are operating in New York, Newark, N. J., Philadelphia, Worcester, Mass., Mt. Vernon, N. Y., Toronto and Montreal, Canada.

Four-Scoop and Four-Rake Charging and Discharging Machines are operating in Detroit, Mich.

These are the only machines that will draw or charge simultaneously 3 or 4 retorts (vertically) and handle from 42 to 60 retorts in from 25 to 30 minutes, lid opening and closing and filling of furnaces included.

Hot Coke Conveyor, Quencher and Steam Exhauster, operating in Toronto, Canada, working in water-sealed flue, rollers being protected from heat and grit.

COAL CRUSHERS, CONVEYORS AND BINS. TURNTABLES FOR MACHINES.

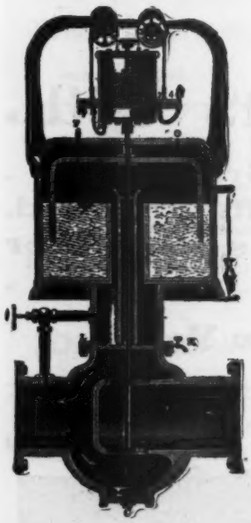
Labor-Saving Machines for Handling Coal and Coke from Coal Cars to Coke Yard or Bins, a Specialty.

G. A. BRONDER,

Contracting Engineer and Builder,

229 BROADWAY, NEW YORK.

CONNELLY IRON SPONGE AND GOVERNOR CO.,



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COAL OR WATER GAS PLANTS,

Automatic, Balance, High Pressure and Service Governors,

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Iron Sponge, Purifying Material for Gas Purification Jones Jet Photometers Pressure Registers, etc.,

INSTALLATION OF SMOKELESS TAR BURNING SYSTEM,

Reinforced Concrete Construction for all Purposes,

Wide Experience in High Pressure Installation and Extension,

GAS SPECIALTIES.

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GAS ENGINEER AND CONTRACTOR

FOR THE ERECTION OF

COMPLETE GAS WORKS

OR ANY PART THEREOF.

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PRACTICAL PHOTOMETRY,

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The Gas Engineer's Laboratory Handbook,

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JAMES D. PERKINS, President. F. SEAVERNS, Treasurer.

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Old Kentucky Shale and O. K. Boghead.

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BERWIND-WHITE COAL MINING COMPANY'S

Ocean Westmoreland Gas Coal.

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STRICTLY High Grade. . . . .
Carefully Prepared.
For Gas Making or
Heavy Steaming. .

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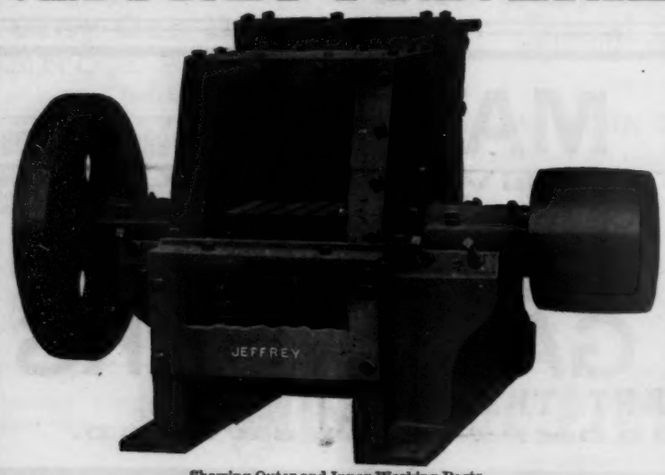
WE ARE READY
TO DEMONSTRATE THE SUPERIORITY
OF
JEFFREY PULVERIZERS



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FREE CRUSHING TESTS.

A Few Strong FEATURES:
Accessibility of Working Parts.
Substantial Pillow Blocks.
Material Partly Crushed in Suspension.
Simplicity in Changes of Parts.

Catalogue No. 30 contains full information. Mailed free with others on
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THE JEFFREY MFG. CO., COLUMBUS, OHIO, U. S. A.
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BINDER for the JOURNAL.

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For Students in Gas Manufacture.

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FRED. BREDEL COMPANY,
ENGINEERS AND BUILDERS OF GAS PLANTS.
Inclined Benches, own system, Recuperative Furnaces, Exhausters, Exhauster Governors, Condensers, Washers, Coolers, Wet Purifying Plants, Purifiers, Oxide Elevators, Hydraulic and Dry Coke Conveyors.
Special High Grade Material for Recuperative Furnaces.
Licensees for ARROLL-FOULIS Charging and Discharging Machines and FRONHAUSER Coke Conveyors. OFFICE, 405 KEENE ST., MILWAUKEE, WIS.

KELLER ADJUSTABLE COKE CRUSHER.

Strong, Simple, Durable. Will Crush any Size Desired.

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Sec. & Supt. Gas Lt. & Coke Co.,
Columbus, Ind.
Correspondence Solicited.

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Examination and Values Ascertained of Artificial and Natural Gas Properties.

COMPLETE GAS WORKS ERECTED.

Artificial and Natural Gas Mains Furnished and Laid

GAS PROPERTIES PURCHASED.

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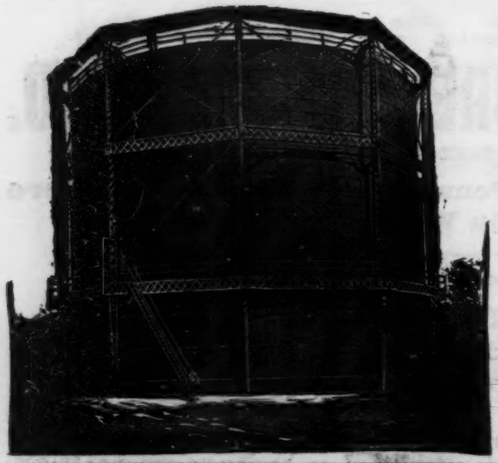

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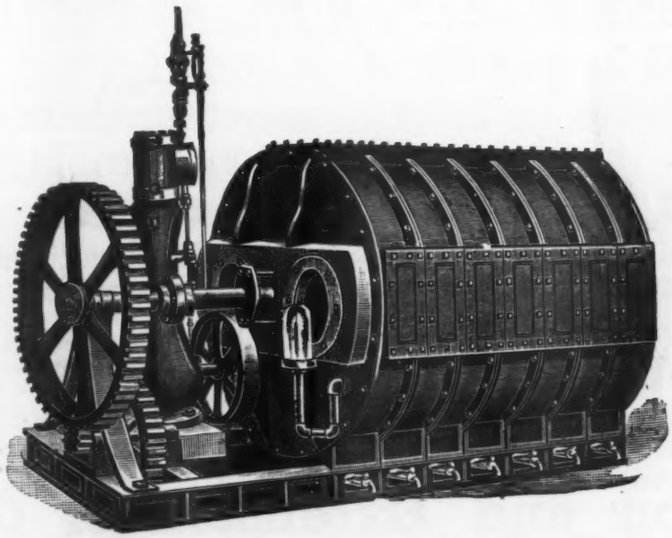

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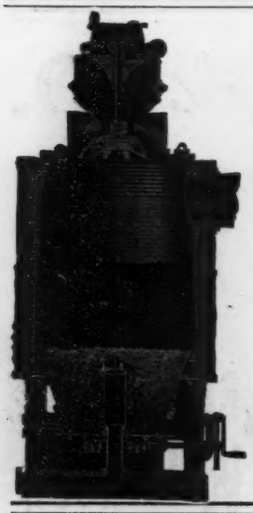

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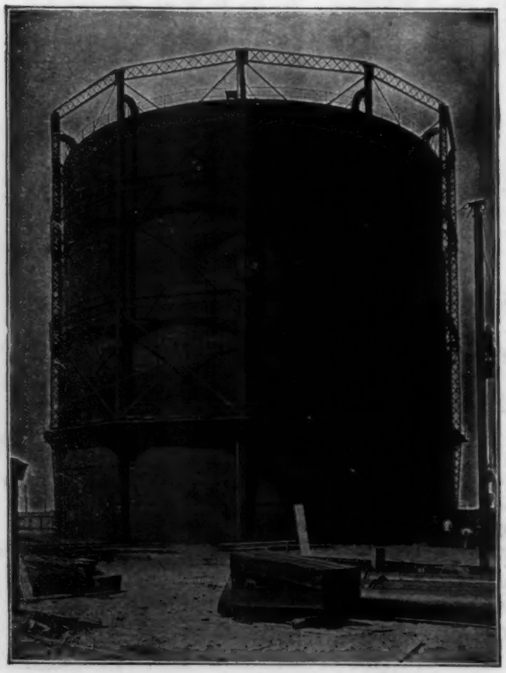

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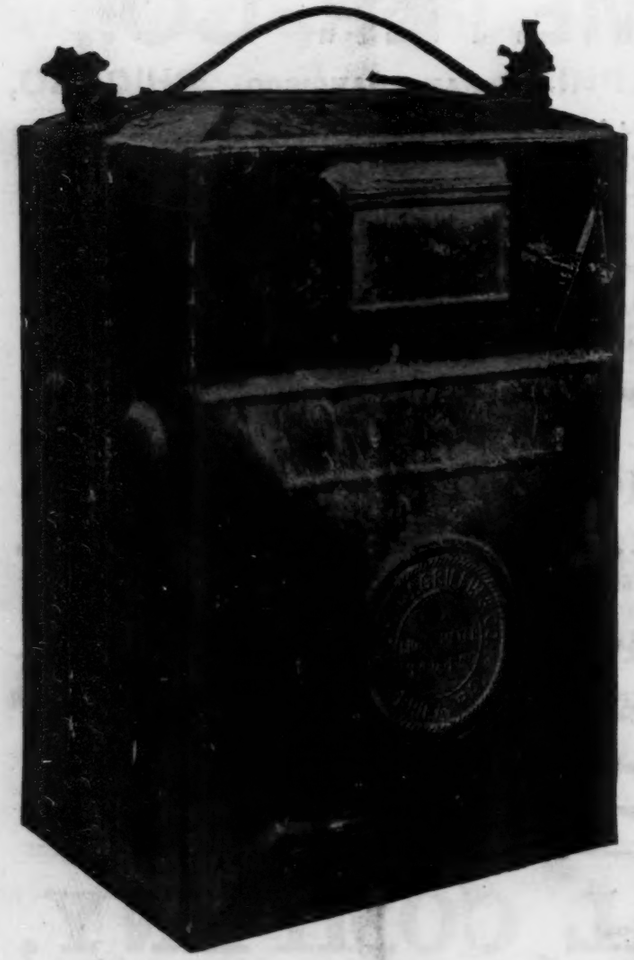

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